an Oil Compete in Plastics?

Must revise production, marketing thinking to meet needs of "prescription" business . . Page 31

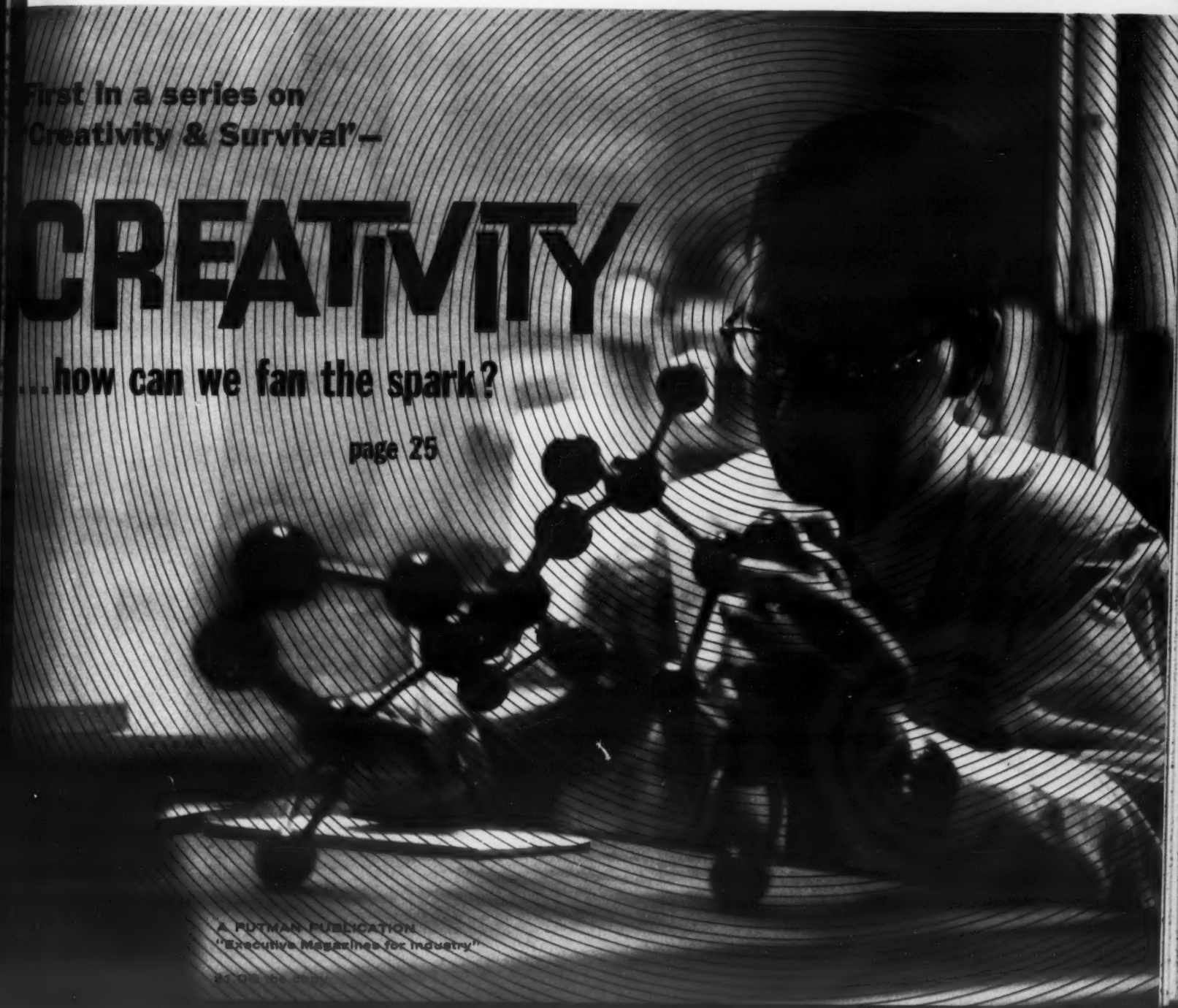
ir-cooled Exchange Gains Favor

Seaboard installation conserves expansion capital, lessens corrosion . . . . . Page 40

CHEMICAL PROCESSING®

CHEMICAL BUSINESS

OCTOBER 1960



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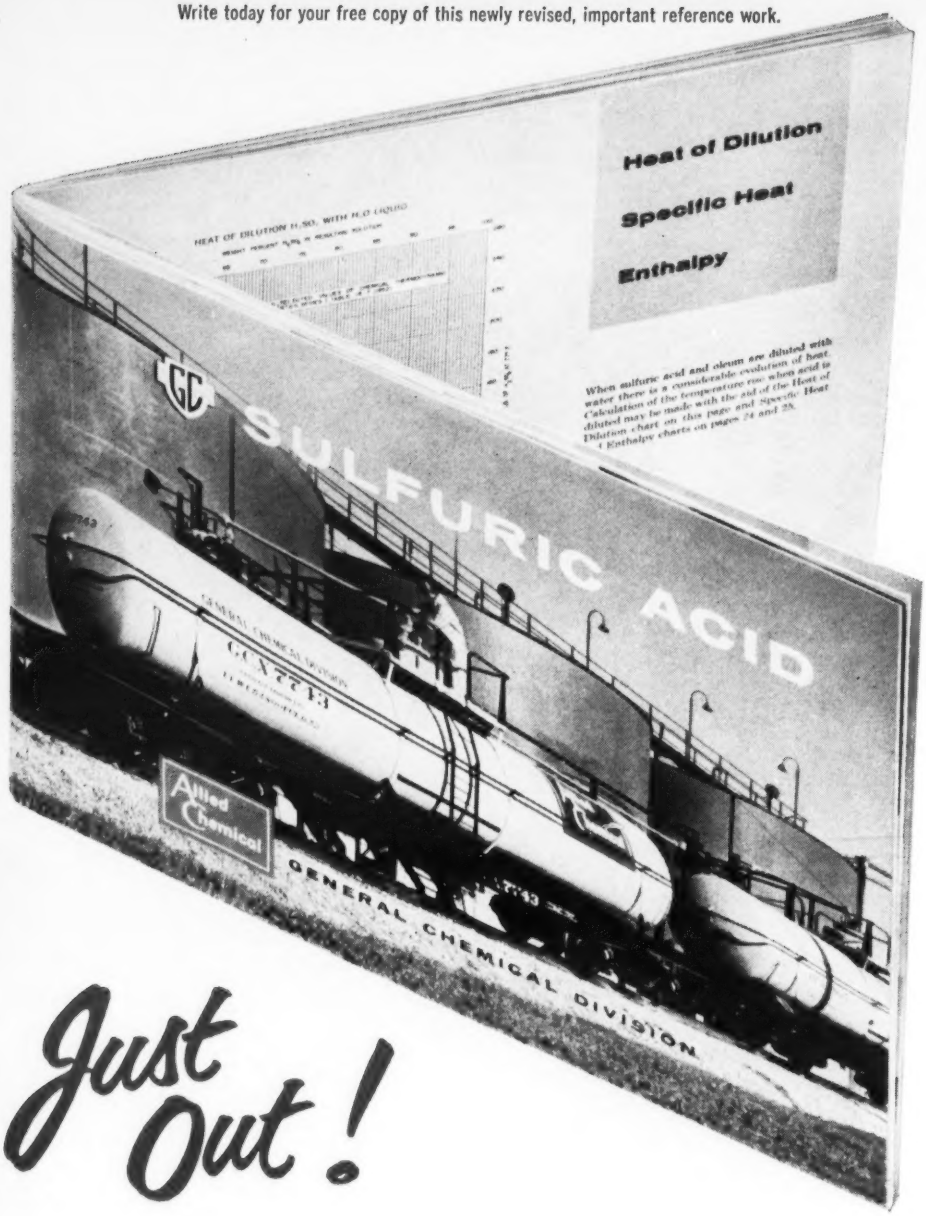
Heat of Dilution
Specific Heat
Enthalpy
When sulfuric acid and oleum are diluted with water there is a considerable evolution of heat. Calculation of the temperature rise when acid is diluted may be made with the aid of the Heat of Dilution chart on this page and Specific Heat Enthalpy charts on pages 24 and 25.
SULFURIC ACID
GENERAL CHEMICAL DIVISION
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New enthalpy curves . . . appearing for the first time . . . enable sulfuric users to calculate heat developed and final temperatures when acid is diluted with water.

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Check 4871 opposite last page.

conventions and exhibits

Oct. 6-7. Western Conference, National Association of Corrosion Engineers, San Francisco, Calif.

Oct. 6-8. Southeast Conference, National Association of Corrosion Engineers, Atlanta, Ga.

Oct. 11-14. Northeast Conference, National Association of Corrosion Engineers, Huntington, W. Va.

Oct. 12-13-14. Combined meeting of the Fourth Conference on Analytical Chemistry in Nuclear Reactor Technology and the First Conference on Nuclear Reactor Chemistry, Gatlinburg, Tenn.

Oct. 17-18. American Coke and Coal Chemicals Institute, Annual Meeting, Greeenbrier, White Sulphur Springs, W. Va.

Oct. 17-19. Technical Association of the Pulp and Paper Industry, Plastics-Paper Conference, Hotel Syracuse, Syracuse, N.Y.

Oct. 17-19. Fall Meeting of the American Oil Chemists' Society, Hotel New Yorker, New York City.

Oct. 17-21. 42nd National Metal Congress & Exposition, American Society for Metals, Trade and Convention Center, Philadelphia, Pa.

Oct. 18. Commercial Chemical Development Association and Chemical Economics Group of the Chemical Institute of Canada. Joint Meeting. Topic, "Chemical Industry of Canada and the U.S.A." Queen Elizabeth Hotel, Montreal, Canada.

Oct. 19-20. North Central Conference, National Association of Corrosion Engineers, Milwaukee, Wis.

Oct. 25-27. South Central Conferenc , National Association of Corrosion Engineers, Tulsa, Okla.

Oct. 29-*Nov.* 2. 25th Paint Industries Show, Sherman Hotel, Chicago, Ill.

Oct. 30-*Nov.* 2. Federation

of Societies for Paint Technology, 38th Annual Meeting, Sherman Hotel, Chicago, Ill.

Oct. 31-*Nov.* 2. The 22nd Annual National Packaging Forum, Packaging Institute, Statler-Hilton Hotel, New York City.

Oct. 31-*Nov.* 4. American Management Association, Packing Management Course, Hotel Astor, New York City.

Nov. 9-10. Chemical Market Research Association, Pittsburgh Hilton Hotel, Pittsburgh, Pa.

Nov. 14-16. The National Association of Corrosion Engineers, Canadian (Eastern Meeting) Montreal, Quebec.

Nov. 28-*Dec.* 2. The 24th National Exposition of Power & Mechanical Engineering, Coliseum, New York City.

Dec. 3-9. Chemical Specialties Manufacturers Association, 47th Annual Meeting, Hollywood Beach Hotel, Hollywood, Fla.

Dec. 4-7. American Institute of Chemical Engineers, Statler Hotel, Washington, D.C.

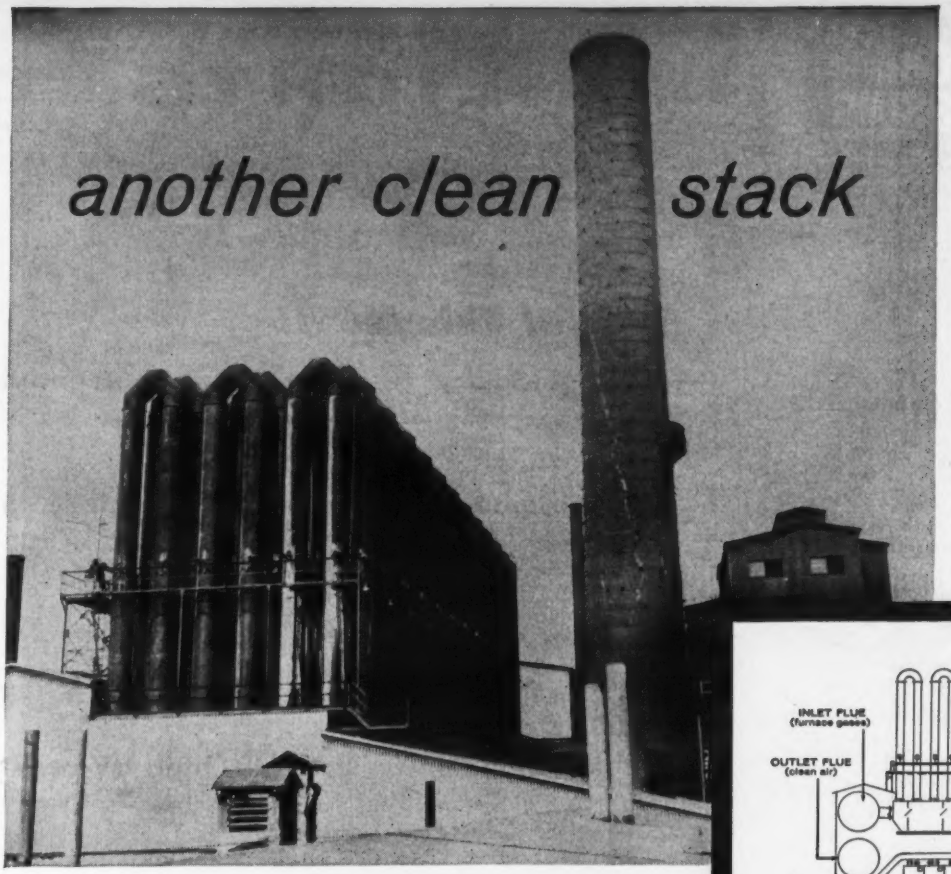
Dec. 8. Annual Meeting of the Synthetic Organic Chemical Manufacturers Association, Hotel Roosevelt, New York City.

Dec. 11-14. American Nuclear Society, Meeting, Mark Hopkins Hotel, San Francisco, Calif.

Jan. 16-19. Winter Instrument-Automation Conference and Exhibit, Instrument Society of America, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis, Mo.

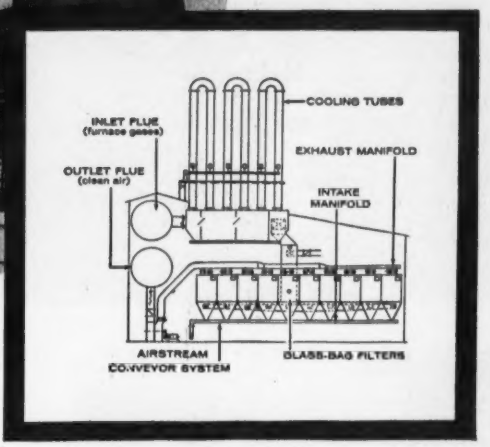
Jan. 24-27. Society of Plastics, Engineers, Annual Technical Conference, Shoreham and Park-Sheraton Hotels, Washington, D.C.

Jan. 30-*Feb.* 2. Plant Maintenance and Engineering Show, International Amphitheater, Chicago, Ill.



(Left) Cooling tubes atop Glass-Bag Filter housing lower furnace gas temperature from 800°F. to 450°, a full 150° below maximum advisable operating temperature. Clean stack proves that filter removes all visible dust.

(Below) System consists of 12 ten-compartment Glass-Bag Filters. Gases at 800° are blown from electrostatic precipitator to cooling tubes which discharge to filter system, resulting in daily collection of about 35 tons of material.



. . . "trade mark" of the Dracco Glass-Bag Filter

Freedom from hot, corrosive dust created by metallurgical processes is one of the many benefits of using Glass-Bag Filters. The clean stack shown in the unretouched photograph testifies to the effectiveness of the Dracco system at Hudson Bay Mining & Smelting Co., Ltd., Flin Flon, Manitoba.

Here is what the system does for Hudson Bay:

- **handles 450,000 cfm of mixed reverberatory furnace and converter gases at 450°F.**
- **recovers approximately 35 tons of valuable metal oxide dusts daily.**
- **maintains operating temperature to prevent condensation of exhaust gases and formation of corrosive acid dews.**
- **eliminates air pollution**
- **reduces cooling equipment requirements, and costs, by 50% over conventional methods.**
- **provides low-maintenance operation and gentle bag cleaning with SWING-CLEAN.**

Glass-Bag Filters, the most advanced equipment now available for fighting air polution and hot dust, have been proved-in-performance in the metallurgical, chemical and cement industries. Virtually 100% collection efficiency is maintained at temperatures to 600°F. Maximum bag life is assured by either of two patented cleaning devices: (1) a mechanism for dust removal by sonics and (2) SWING-CLEAN, gentle swaying action.

For full details on how Glass-Bag Filters can help you lick that hot dust problem, write: Dracco Division of Fuller Company, Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

DRACCO *airstream* conveyors
dust control equipment

Check 4872 opposite last page.

CHEMICAL PROCESSING
CHEMICAL BUSINESS

HIGHLIGHTS

OCTOBER 1960
VOLUME 23 • NUMBER 10

THIS MONTH'S COVER

A man with pencil and notebook —this is the lonely creative mind at work, probing for fundamental truths. Our man is Dr. A. S. Kende of the Pearl River Laboratories of American Cyanamid, one of those companies that recognize the need to stimulate creativity and basic industrial chemical research. But there's much room for more intense stimulation of this sort. Our survival could depend upon it . . . . page 25.

Special This Month

25 Is industry research short on creativity?
Company labs must contribute more to basic knowledge, say research leaders

28 Equipment leasing up 100% since '58
Big reason for boom: release of working capital for more profitable use. But that isn't all . . .

31 Can oil compete in plastics?
May find it tough adjusting marketing strategy and production philosophy to a "prescription business"

63 Epoxides boast strength, high UV resistance
New PVC uses ahead with epoxidized plasticizers via acetaldehyde-to-peracetic acid route

127 Corrosion Keys: Where can you use Teflon?
Check these charts for specific corrosives at various temperatures, concentrations

162 Centralized pump repair saves $150,000/yr
Teams up with pump-standardization program at Du Pont's Chambers Works

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38 Five years of computers; what have we learned?
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103 Jet mills grind 6 ton/hr TiO_2 to 1/4 micron
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over the editor's shoulder

CRISIS

Both presidential candidates agree that the survival of our democracy may well depend upon the outcome of the technological race that our nation is finding itself engaged in with the Soviet Union. Demand for engineers in the U. S. keeps going up, but engineering college enrollments still continue to drop.

What can be done to overcome the complacency and lack of scientific interest prevalent in today's youth?

President Eisenhower's special assistant for science and technology, Dr. George B. Kistiakowsky, believes that more person-to-person contact by scientific personnel with the public is needed if we are to bolster public understanding of science and encourage our youngsters to pursue technical professions.

As members of the chemical industry, it is our duty to continually promote science. We can all help by becoming more active in community and civic affairs, volunteering for vocational guidance work in our favorite technical society and by embarking on our own "back-yard" public relations program.

Seize every opportunity to ignite that spark of interest in our youngsters. The chance may come anywhere, anytime — at PTA meetings, church activities, sporting events, Scout groups, picnics — even in your own home. Set a goal for yourself: Get at least one child launched on a scientific career.

The Soviets keep pushing harder to turn out engineers faster and in greater quantities. Our country cannot afford to finish second in this race. Get started on your PR campaign today! Let's not waste any more time . . . it may be MUCH later than we think.

Ted F. Meinhard

Associate Editor

WITHOUT ADEQUATE PROTECTION, this spectacular tank fire spread wildly and caused many thousands of dollars of refinery property damage.

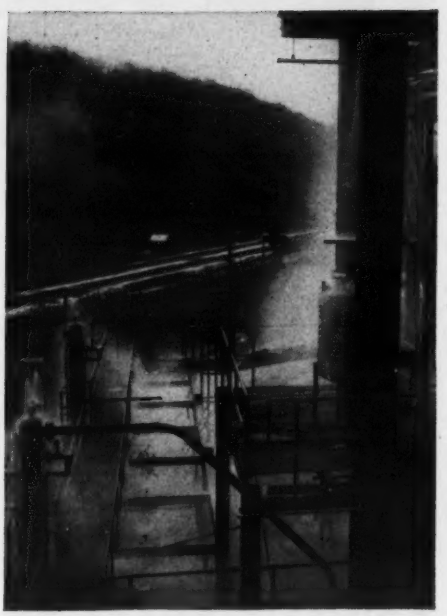
Keep tank fires from getting out of control with Grinnell Water Spray

Proper safeguards are uppermost in importance in protecting tanks which contain flammable gases and liquids in the event of fire. For example, tanks must be guarded against extreme heat exposure. Leaking gas, if it should develop, must be diluted to the point where it will not burn. And fire, if it should occur, must be localized and controlled or extinguished.

With a Grinnell Water Spray System, you get such protection.

Before heat raises tank temperatures dangerously, an enveloping spray of water provides instant cooling, reducing internal pressure which helps prevent rupture. In addition, air turbulence is created (even in still air) which, in conjunction with the water vapor from the spray, helps dilute the flammable vapors to control or extinguish the fire. Flammable products which cannot be safely extinguished can be safely burned off under the protecting water spray.

FREE REFERENCE MANUAL. For a comprehensive picture of all the most advanced methods of special hazard fire protection, request your free copy of "Special Hazard Fire Protection by Grinnell." Write Grinnell Company, Providence 1, R. I. Branches in principal cities.



GRINNELL WATER SPRAY SYSTEM under test at the Marietta, Ohio plant of the Bakelite Union Carbide Plastic Company, a division of the Union Carbide Corporation. Water — when it is applied in time and distributed over the surfaces efficiently by a properly engineered system — is most effective in limiting tank fires and controlling their spread.

GRINNELL

FIRE PROTECTION SYSTEMS SINCE 1870

Check 4873 opposite last page.

for chemical processing requirements...

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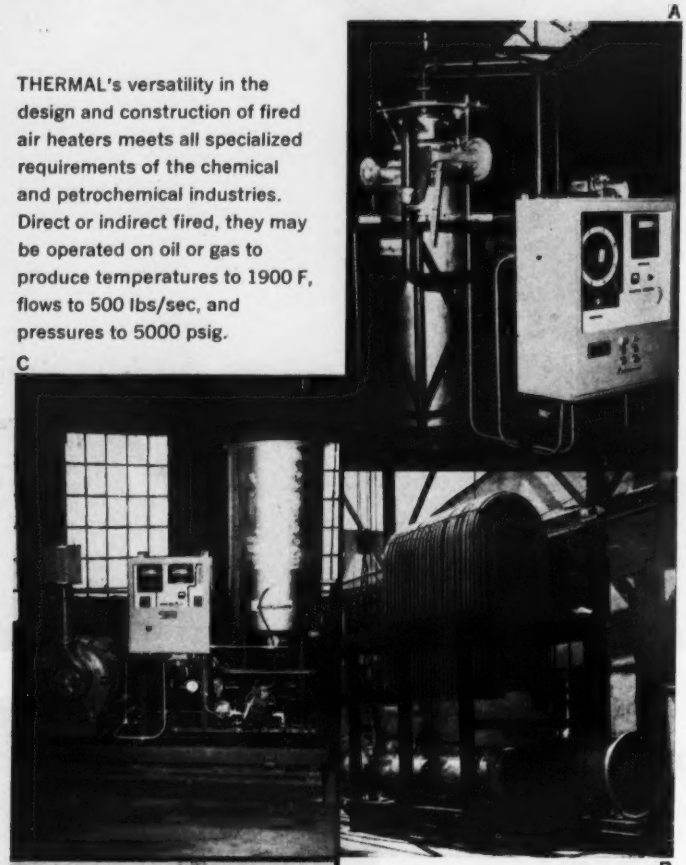
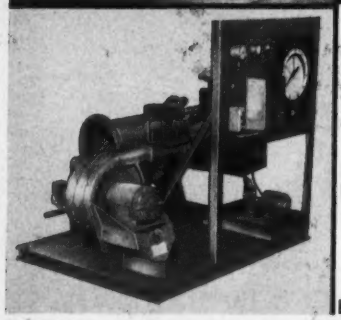
FIRED AIR HEATERS

THERMAL's versatility in the design and construction of fired air heaters meets all specialized requirements of the chemical and petrochemical industries. Direct or indirect fired, they may be operated on oil or gas to produce temperatures to 1900 F, flows to 500 lbs/sec, and pressures to 5000 psig.





A. Fully packaged 1,500,000 btu/hr indirect type air heater including all controls.

B. Tube bundle in fabrication (inverted) for a 150 lbs/sec, 900 F 150 psig air heater.

C. Direct fired heater for 6,000,000 btu/hr 3 psig pressure including all controls.

D. Completely "packaged" 600,000 btu/hr air heater to provide a wide range of outlet temperatures from 600 F to 1600 F for aircraft parts test work.

For further information write for Bulletin 113 (indirect fired) • 112 (direct fired)

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Check 4874 opposite last page.

CHEMICAL PROCESSING
CHEMICAL BUSINESS

October 1960

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CONTROLS WALL THICKNESS AT THE BEND

Long tangent elbows may *look* very much alike—but micrometers don't deceive. "Section" a Speedline elbow and compare it with any other. Then consider the difference Speedline *controlled wall thickness* can make in your critical process lines.

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Leading plants have proved there *is* a measurable difference in quality with Speedline fittings . . . the only complete line of long tangent fittings available from distributor stocks from coast to coast. Let a Speedline distributor prove the difference Speedline can make at your plant.

See pages 1513 to 1516 of the Chemical Engineering Catalog for Distributor listing. Complete catalog information available on request.

Out-Dated Forming Methods Reduce Wall Thickness as Much as 35% at the Bend.
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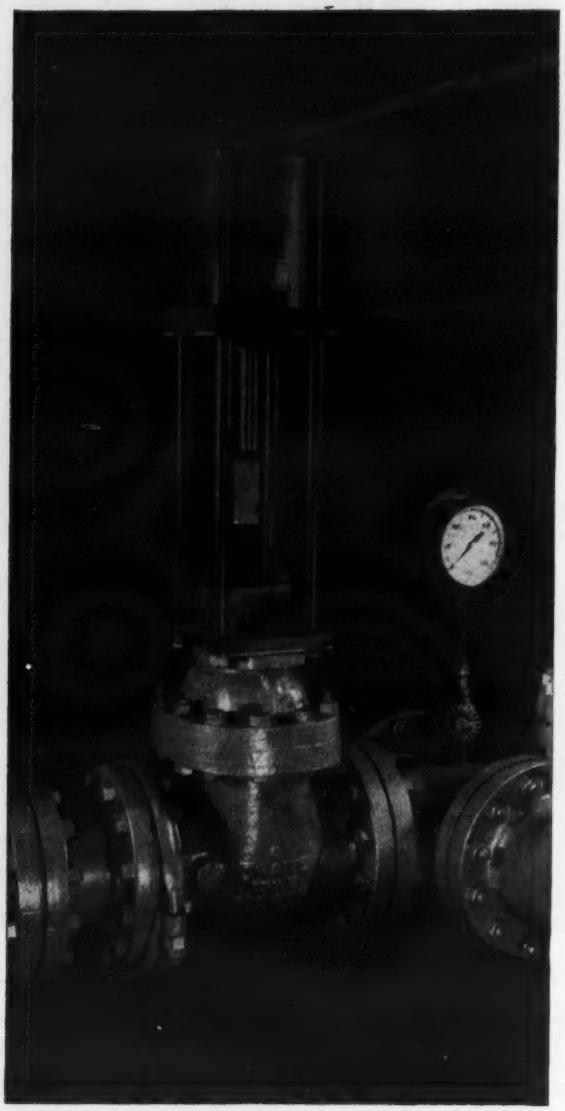
...a fast-moving program of planned expansion, product development, and streamlined distribution to help our customers meet the competitive challenges of the Sixties.

NEW CRANE CYLINDER OPERATORS— LOW-COST POWER OPERATION FOR GATE VALVES



Now you can control any flow process easier and faster with cylinder operated Crane valves. Large valves . . . valves in remote or inaccessible locations . . . valves that must be cycled many times a day . . . all these can now be operated at the touch of a finger, saving time and manpower. These benefits of power operation are available from Crane now—at lower cost and in less time than ever before!

Crane cylinder operators are available for Crane O. S. & Y. iron body wedge and double-disc gate valves, and for pulp stock valves. Control devices for local or remote actuation supplied at extra cost.

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This new valve operator is another example of how Crane solves your flow problems more economically, more productively. The Crane solution —the right answer to your flow problems—is as close as a phone call to your Crane distributor. Call him today.

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Valves • Electronic Controls • Piping • Plumbing
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CHEM-TRENDS / Our Growing Industry

Steel slump spurs boosts in petroleum naphthalene, orthoxylene output

Continuing shortage of naphthalene supplies, primarily due to decline in steel production, is spurring interest in both petroleum naphthalene and orthoxylene.

Sun Oil Company has awarded the engineering and construction contract for a proposed $8 million naphthalene plant to the **M. W. Kellogg Company.** To be constructed at Sun's Toledo, Ohio, refinery, the plant will have a capacity of 100 million lb/yr and will be the world's largest petroleum naphthalene plant. It is scheduled to be in operation by the end of 1961.

With many domestic and foreign phthalic anhydride producers turning to orthoxylene to supplement their raw material supply, the **Enjay Chemical Company** is taking steps to increase the Baytown, Texas, orthoxylene plant capacity from 44 to 72 million lb/yr by the end of this year. Capacity can be expanded to 165 million lb/yr if demand justifies.

Meanwhile, **Delhi-Taylor Oil Corporation** has completed two new 160′ high distillation towers at its Corpus Christi, Texas, refinery which will add considerably to the nation's industrial capacity for orthoxylene.

Capacity of **National Distillers' U.S.I. Chemicals Co.** Division polyethylene production plant at Houston, Texas has been doubled with the placing on-stream of a new section. This makes U.S.I. the second-largest producer of polyethylene in the world, according to company officials. Total U.S.I. production capacity of low and medium den-

To page 10

AS CP's EDITORS SEE THEM *Chem-trends*

•Increasing unavailability and rising cost of land for large-scale liquid storage is forcing industry and municipalities underwater. Recently shown were underwater storage facilities — flexible bags in Florida and in Texas a steel tank assembly built by Bethlehem Steel to rest on the Gulf floor 25 ft below the surface. The bags can be used to store a variety of materials, including potable water. The tank unit is particularly designed for up to 20,000 bbl of crude oil from wells 35 miles off shore. Its maker reports same design principles can be used for units of up to one million gallons, resting as deep as 200 ft.

•Revision of Food Additives Amendment of 1958 to authorize the Secretary of Health, Education and Welfare to grant further time extension clearance of certain food additives is advocated by MCA. In a recent talk, K. E. Mulford, chairman of MCA's Food Additives Committee, cited difficulties of developing practical quantitative methods of analysis for some ingredients, plus a shortage of properly skilled research personnel and facilities as some of the factors.

•In another action, MCA issued recommended procedures for packaging, handling, transportation and storage of fertilizer-grade ammonium nitrate, terming the product as one which "can be handled with complete safety if recommended procedures are observed." Extreme caution to avoid contamination with foreign matter, particularly organic materials, is urged. Spontaneous heating of stored fertilizer grade NH_4NO_3 is disclaimed.

•A smog-reducing apparatus will be standard equipment on all 1961 Studebaker Lark 6-cyl models distributed in California.

•Junior high schools are said to take a shellacking in James Bryant Conant's most recent study of our educational system. The new report, to be ready October 9th, criticizes pressures which force too many children into gifted classes which are beyond them, and academic programs and accelerated courses of which they are not capable.

•Special pre-semester course in use of electronic computers was recently given 140 engineering freshmen entering Princeton University. Purpose of three-week session, according to Dean Joseph C. Elgin, is to acquaint freshmen with some early insight into fundamentals of their future profession.

•First private production of reactor-produced radioisotope for chemical use has been announced by Abbott Laboratories. Product is sodium radio-iodide (I-131). Lots of up to 50 grams are being irradiated at two sites. Key factor is separation of Te-131 from I-131, which in Abbott process is by solution in Na-OH, with sodium sulfite as anti-oxidant. Product should find big market among producers of medical grade I-131, widely used in cancer therapy, particularly in view of Abbott's price being 20% below current AEC quotations — a factor which may raise questions of arbitrary Government pricing policies.

•Automatic sentinel to monitor Ohio river waters for pollution will be installed and placed in operation this fall on the river and its major tributaries. Developed by the Ohio River Valley Water Sanitation Commission, the Orsanco robot monitor consists of an analyzer, transmitter, telemeter receiver, and data logger and transcriber. It will perform tests and at specified intervals relay the data to the commission's offices in Cincinnati. When unusual conditions are detected an alert will be issued to water users and regulatory agencies.

•Heat-transfer equipment built in West Germany for 50% the cost of building same units in United States was reported by manufacturer at recent AIChE-ASME Heat Transfer Conference in Buffalo, N.Y. Asked if he had actually verified German costs, he stated accounting records had been examined and found to carry figures permitting this conclusion. "In addition to German workers giving every evidence of high productivity on the job, they receive 75¢/hr in comparison to my workers getting $2.25. Besides, their plant is equipped with new (postwar) machine tools, as the previous tools were ruined by bombing. Their tools are therefore newer than mine . . ."

•U.S. investors' short-term investment capital is fleeing to booming Europe in increasing quantities. Believed to be a natural aftermath of recently lowered interest rates authorized by the Federal Reserve System, the effect is causing some concern in Europe. Also adding to surplus capital on the Continent are Belgian funds apparently withdrawn from the troubled Congo. Viewing this as an inflationary threat, Germany and Switzerland have with reluctance taken special measures to try to halt the flow. In the past such capital influx has been regarded as welcome by Europeans, but present effect on lending power of established banking systems is causing tension.

•Non-pressurized storage of liquid ammonia is being undertaken at Tuscola, Ill., by U.S. Industrial Chemicals Co., div. National Distillers. 6000-gallon refrigerated tank assembly consists of two shells. Inner shell is 88-ft diam by 56-ft high, is separated from outer shell by 2½-ft-thick insulation. Contents will be maintained at −28°F by refrigerating effect of evaporation of NH_3 from liquid surface. Evaporated NH_3 will be fed directly to adjacent ammonium nitrate converter, or can be recompressed and recirculated in tank as necessary.

•Requests for exports of U.S.-made goods to the Soviet Union and other countries behind the Iron Curtain are continuing at about the same rate as a year ago, according to a report presented recently to Congress by Commerce Secretary Frederick H. Mueller. Value of shipments approved for first half of 1960 took a sharp increase over 1959, amounting to $60 million, compared to an earlier $14 million.

STEPHENS-ADAMSON

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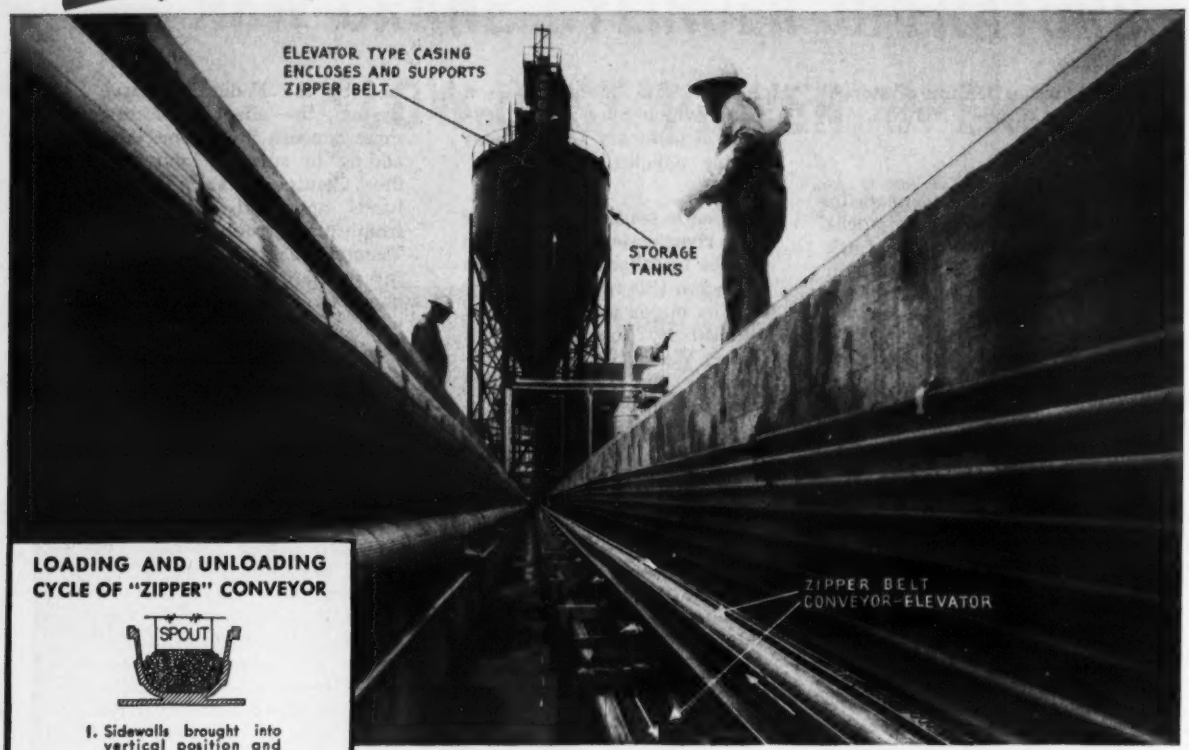
"ZIPPER"* CLOSED-BELT CONVEYOR-ELEVATORS

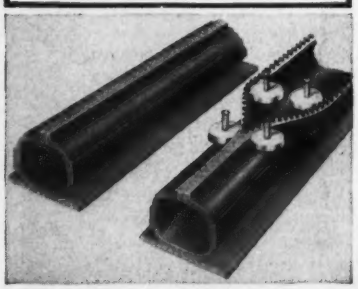


LOADING AND UNLOADING CYCLE OF "ZIPPER" CONVEYOR

1. Sidewalls brought into vertical position and ready for loading.

2. Flexible tube completely closed for conveying and elevating.

3. Rubber ZIPPER belt open for discharge, cleaning and return run.



Upper left unit closed and loaded. Lower right shows how belt is opened and closed by system of ball bearing rollers. (Rollers are mounted on a rigid framework)

CONVEYS AND ELEVATES BY CONTINUALLY WRAPPING MATERIAL IN A PACKAGE... MOVING THE PACKAGE AND ITS CONTENTS TO A NEW LOCATION AND GENTLY UNWRAPPING IT!

Literally a moving material-carrying conduit, the ZIPPER Conveyor is capable of transporting bulk materials in any plane, to considerable heights and around obstructions. Its great advantage is that bulk materials may be conveyed within the belt completely sealed and dust-tight. Material doesn't slide, isn't scooped, pushed or thrown but is gently carried over great distances without breakage, agitation or segregation. The ZIPPER Conveyor-Elevator provides versatility of layout and profitable material handling advantages you won't want to overlook.

*PATENTED

WRITE FOR BULLETIN 349

S-A

ENGINEERING DIVISION

STEPHENS-ADAMSON MFG. CO.

GENERAL OFFICE & MAIN PLANT, 11 RIDGEWAY AVENUE, AURORA, ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA • CLARKSDALE, MISSISSIPPI
BELLEVILLE, ONTARIO

Check 4877 opposite last page.

Our Growing Industry

From page 8

sity polyethylene resins is now 300 million lb/yr.

The **Dow Chemical Company** is starting construction of facilities to produce polyethylene foam at its Hanging Rock plant, Ironton, Ohio, with completion scheduled in June 1961.

Kaiser Aluminum & Chemical Corporation has begun construction of Gary, Indiana, plant for primary purpose of calcining petroleum coke. Million-dollar facility will have capacity of approximately 120,000 tons of coke/yr.

Names of two of **W. R. Grace & Company's** eight chemical divisions are being changed, to reflect increased scope of operation. **Grace Chemical Division** becomes **Nitrogen Products Division**, while **Dewey and Almy Overseas Division** becomes **Overseas Chemical Division.**

With $26 million earmarked for investment in new plants, products and equipment in the next two years, **Archer-Daniels-Midland Company** is marking a change in emphasis from some traditional endeavors to fields where promise of profits is greater.

Eighty percent of spending program will go for capital improvements and to expand production and increase efficiency. Program will involve closing of some plants, sale of some operations.

E.I. du Pont de Nemours & Company, Inc., will build $2 million sales-service laboratory at Chestnut Run, Del. Dual purpose of the lab will be to assist customers with technical information and develop new uses for industrial chemicals made by the company's Industrial and Biochemicals Department.

A multi-million dollar addition will be made to **American Cyanamid Company's** Brewster, Fla., plant which will double the company's production of wet-process phosphoric acids. With addition, plant will be capable of producing approximately 400,000 tons of wet-process

To page 12

THAT'S INTERESTING

Synthetic meerschaums

Briars, coated with a white synthetic formulation are proving more durable, less brittle than true meerschaums. Yet, they yellow while smoking as do the meerschaums.

Coating was developed by Coating Materials Laboratories Division of Sun Chemical Corp. for Kaywoodie Co.

Road warns drivers

A road near Richmond, Calif., is telling drivers to slow down as they approach danger spots. Rock-and-plastic "rumble strips" are placed ahead of hazardous sections. As the car passes over these, vibrations alert driver.

High-impact Isopolyester resin is used to bind rock chips into skid-resistant layer which should last five yr.

For more information on product at right, specify 4878 see information request blank opposite last page.

CARBORUNDUM'S TECHNICAL INFORMATION ON ELECTRIC HEATING

Data sheet

PROTECTIVE ATMOSPHERE HEATING

with silicon carbide elements

For heating operations requiring special atmospheres, furnaces equipped with silicon carbide elements offer particular advantages. This radiant electric heat is clean, efficient, and gives accurate temperature control. There are no exhaust gases and combustion fumes . . . no fire or explosion hazards to consider.

Some atmospheres, such as argon and helium, are actually conducive to good element life. Others may tend to affect element performance somewhat. In those instances, our engineering staff will gladly offer usage recommendations. Moreover, if you adhere to the operating temperatures and watt loadings shown in chart on right, the silicon carbide elements will give long, troublefree service.

Advantages often offset fuel cost differentials

GLOBAR® silicon carbide elements for heating in oxidizing or reducing atmosphere offer greater economy than is indicated by a simple comparison of fuel and electricity costs. Some of these advantages are:

- *Rod type elements simplify furnace design.*
- *Maintenance is reduced and servicing made easy.*
- *No exhaust gases or combustion fumes and lower heat loss mean cooler, safer working conditions.*
- *Elements quickly removed and replaced from outside the furnace. No need to cool the chamber and hold up production.*
- *Temperatures accurately controlled.*
- *Elements can be operated continuously or intermittently in oxidizing or protective atmospheres.*
- *"On line" operation can be used in many applications, thus eliminating the cost of transformers.*

For the full facts on heating with GLOBAR silicon carbide elements, call Carborundum or an experienced electric furnace builder.

Typical applications of GLOBAR® silicon carbide heating elements

Annealing, sintering, brazing and heat treating of metals
Firing ceramics
Calcining powders and magnetic materials
Roasting fluorescent oxides
Firing of porcelain enamel
Reduction of oxides
Subliming molybdic oxide
Production of magnesium

GLOBAR silicon carbide heating elements are available from large stocks, or can be supplied within 2 weeks if manufacture is necessary. Sizes range from ½" to 2⅛" in diameter and from 4" to 105" in length. Elements are matched to meet your requirements.

MAXIMUM WATT LOADING OF GLOBAR® ELECTRIC HEATING ELEMENTS IN RELATION TO FURNACE CHAMBER TEMPERATURE

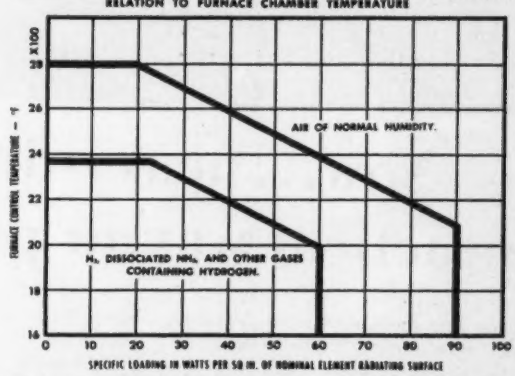


Chart above indicates recommended maximum temperatures and watt loadings for GLOBAR silicon carbide elements. Upper curve covers atmospheres of air, compositions of oxygen, carbon dioxide, argon or helium. Lower curve covers atmospheres of hydrogen, nitrogen or compositions containing carbon monoxide.

Write today for your free copy of our technical "Bulletin H" describing physical and electrical characteristics of GLOBAR elements. The address: Dept. CP-90, Globar Plant, Refractories Division, Carborundum Co., Niagara Falls, New York.

For latest advances in silicon carbide heating elements . . . count on **CARBORUNDUM®**

From page 10

54% phosphoric acid annually.

With completion next month of ultra-high purity gaseous hydrogen plant of 18 million cu ft/month capacity at Newark, N.J., **Air Products, Inc.**, expects to become the major supplier of this product for the eastern half of the United States. A similar capacity plant was put on stream at Hopewell, Va., in August. The new plants coupled with hydrogen facilities at Edgewood, Md., and Painesville, Ohio, will give Air Products capacity of over 75 million cu ft/month.

Witco Chemical Company, Inc. has traded 300,000 shares of Witco stocks for 100% interest in Sonneborn Chemical and Refining Corporation and its subsidiaries. Sonneborn will become an independently operated, wholly-owned subsidiary.

The Firestone Tire & Rubber Company reports four new plants are nearing completion, part of $120-million expansion and modernization program undertaken by the company during its 60th year. New installations include a plant in Orange, Texas, to manufacture Coral and Diene rubbers; a nylon producing plant in Hopewell, Va.; and plants in Canada and France. These projects will give Firestone a total of 75 plants.

Construction of what will be one of the nation's largest chemical fertilizer plants is being planned by **California Spray-Chemical Corporation**, subsidiary of **California Chemical Company**, which in turn is wholly-owned subsidiary of **Standard Oil Company of California.** The $22 million facility will be built at Fort Madison, Iowa, and will be capable of producing more than 1000 tons daily.

Olin Mathieson Chemical Corporation is doubling the output of a water sanitizing, dry chlorine chemical manufactured at Niagara Falls, N. Y., to meet increased demands created by growing number of home swimming pools.

Now...heavy-duty Nickel Plating: practical way to protect product purity

Where you don't need solid corrosion-resisting materials, .005" to .015" of Nickel Plating on process equipment resists a variety of corrosives and protects product purity

You're looking at some samples produced by today's techniques of Nickel Plating.

With a thick layer of corrosion-resisting Nickel between basis metal and corrosive media, your pure process stream *stays* pure. And your equipment lasts longer, protected by plated armor of Nickel.

Today your new equipment can be Nickel Plated before or after fabrication

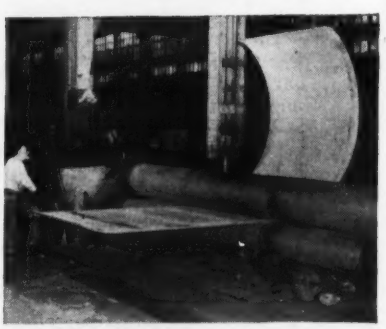
New equipment can be made from pre-plated steel or other metals, available from electroplaters in a variety of mill forms with a heavy, uniform coating of Nickel.

Equipment already fabricated can be protected by electroplating with Nickel. A new chemical reduction process—called *electroless* plating—can be used to apply a corrosion-resisting layer of high-nickel alloy even on inside surfaces and over the most complex shapes.

Yours for the asking. You can easily get the important facts you want to know about heavy-duty Nickel Plating. Write for a copy of Inco's new 20-page booklet, "Industrial Nickel Plating."

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO Inco Nickel



Large sheets or plates can be plated with Nickel on one or both sides ranging in thickness from .005" to .015". These plates are fabricated by all conventional techniques into tank cars, chemical barges, caustic evaporators, and similar units for many requirements of the chemical industry.

Check 4879 opposite last page.

Spotlight On People

Soviet Academy of Sciences like large U.S. chemical company

. . . says recent USSR visitor

"In some respects the Soviet Academy of Sciences is organized and functioning like the product and process research and development arm of a large chemical company such as in the United States. Further, the Soviet Academy actually has the authority to decide what products will be manufactured. Thus, for all practical purposes we should regard the Academy as the key group of what will more and more be a formidable competitor to the private enterprise chemical industry of the Western world."

With these words, Dr. Charles G. Overberger (above), head of the Department of Chemistry, Brooklyn Polytechnic Institute, began a report of his recent visit as speaker at International Union of Pure and Applied Chemistry meeting in Moscow.

In elaborating his impressions of the Academy, Overberger reports its research facilities good, equipment of high quality and plentiful. Some labs are old but adequate. New buildings are forthcoming. He saw indications of freedom of action on the part of Academy Institute scientists that he places somewhere between that of an American industrial chemist and one in university research.

A strong tradition to carry out basic research exists in the Institutes, but Government pressure for products is causing more effort channeled into development.

It is in the practical evaluation of products that Overberger believes the Soviet's are weakest — which partly explains why they have not kept up with the chemical companies of the West. The Academy people have never had the intense industrial competition for processing and product improvements that we have had in the West. As increased trade with the West continues, however, he believes it will be inevitable that this area will develop more fully.

— *John Mellecker*

Howard S. Bunn has been elected to the newly created office of vice-chairman of the board and **Birny Mason, Jr.**, elected president of Union

screens

GREATEST CAPACITY, per-square-foot of screen cloth area • EFFICIENT FOR ALL MATERIALS, wet or dry, fine or coarse, hot or cold • EASY TO INSTALL, light-weight, no transmitted vibration • ECONOMICAL OPERATION, low maintenance • FLEXIBLE, 18", 30" & 48" dia. units, single or multiple separations • CLEAN SEPARATION, ACCURATE SIZING, in range from coarse to 325-mesh • LONG SCREEN CLOTH LIFE, less blinding • SELF-CONTAINED, ready to operate.

chemicals

SWECO Vibro-Energy Separators screen a wide range of products for the chemical processing industry, faster and better. For example: Industrial organic and inorganic chemicals. Drugs and cosmetics. Vinyl, polyethylene, and other plastic pellets. Soaps and detergents. Urea, phosphate and other fertilizers. Latex and other rubber materials. Waste fluids. Paint pigments, and many other products.

For technical data or free screening demonstration in *your* plant, with *your* materials, write: Dept: 3-3

SOUTHWESTERN ENGINEERING COMPANY

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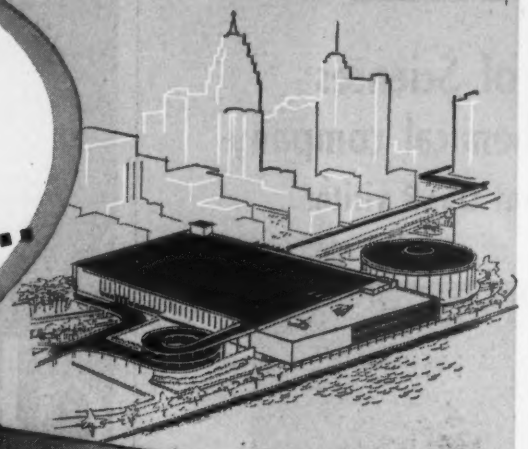
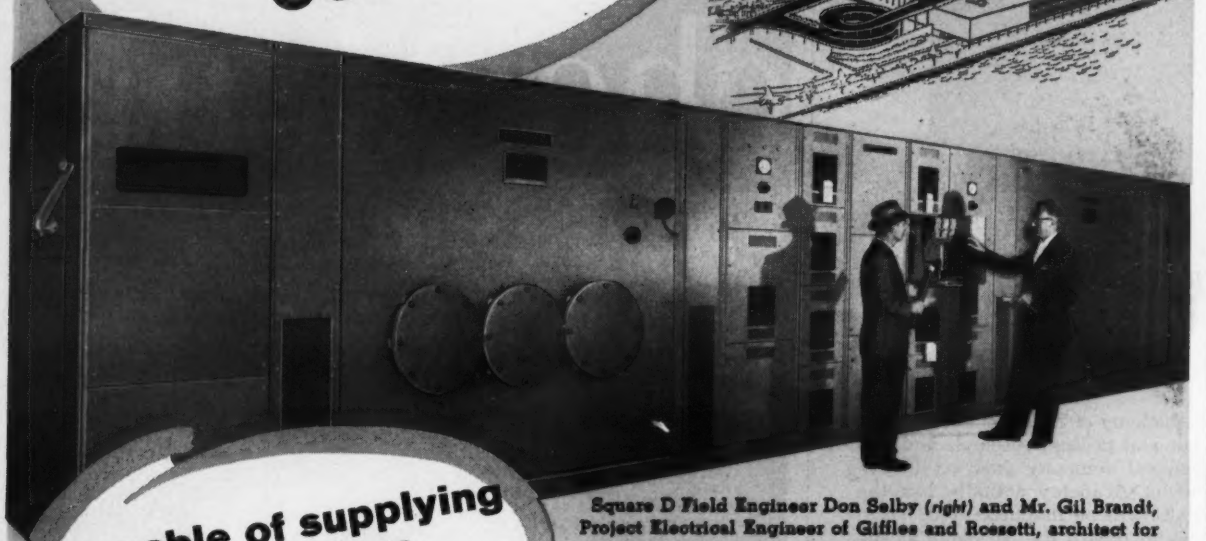
Engineers • Constructors • Manufacturers

Check 4880 opposite last page.

11 SQUARE D SUBSTATIONS SERVE COBO HALL...

World's largest exhibition building, COBO HALL occupies 10 acres of Detroit's Civic Center





...capable of supplying 22,000 KVA of continuous power!

Square D Field Engineer Don Selby *(right)* and Mr. Gil Brandt, Project Electrical Engineer of Giffels and Rossetti, architect for COBO HALL, examining one of the drawout circuit breakers in the low voltage secondary portion of a Square D 2000 KVA double-ended unit substation equipped with nitrogen-filled transformers

Easy, fast installation was a prime objective when eleven Square D unit substations went into COBO HALL. The various sections of each substation were completely coordinated at the factory. Reconnection of those sections at the job site required a minimum of time and labor.

Design leadership is very much in evidence in Square D's broad line of unit substations. We suggest a three-point comparison to prove the point—ease of installation, minimum maintenance, maximum safety for both equipment and personnel.

AMONG OTHER SQUARE D EQUIPMENT IN COBO HALL

31 Control Centers
28 Switchboards
450 Panelboards
75 Contactor Panels
1 Dimmer Board
10 Dimmer Panels
16 NEMA 4-Circuit Interrupters
120 Spotlight Control Panels
19,000 feet of Lay-In Duct

SQUARE D COMPANY

wherever electricity is distributed and controlled

Check 4881 opposite last page.

PEOPLE

Carbide Corporation. With Union Carbide since 1922, Mr. Bunn moves from president, a position held since 1958. Associated with Union Carbide since 1932, Mr. Mason was elected executive vice-president and member of the board in 1958.

Norman E. Hathaway has been appointed executive vice president of Allied Chemical's Nitrogen Division. He had been assistant to the division president since Jan. 1.

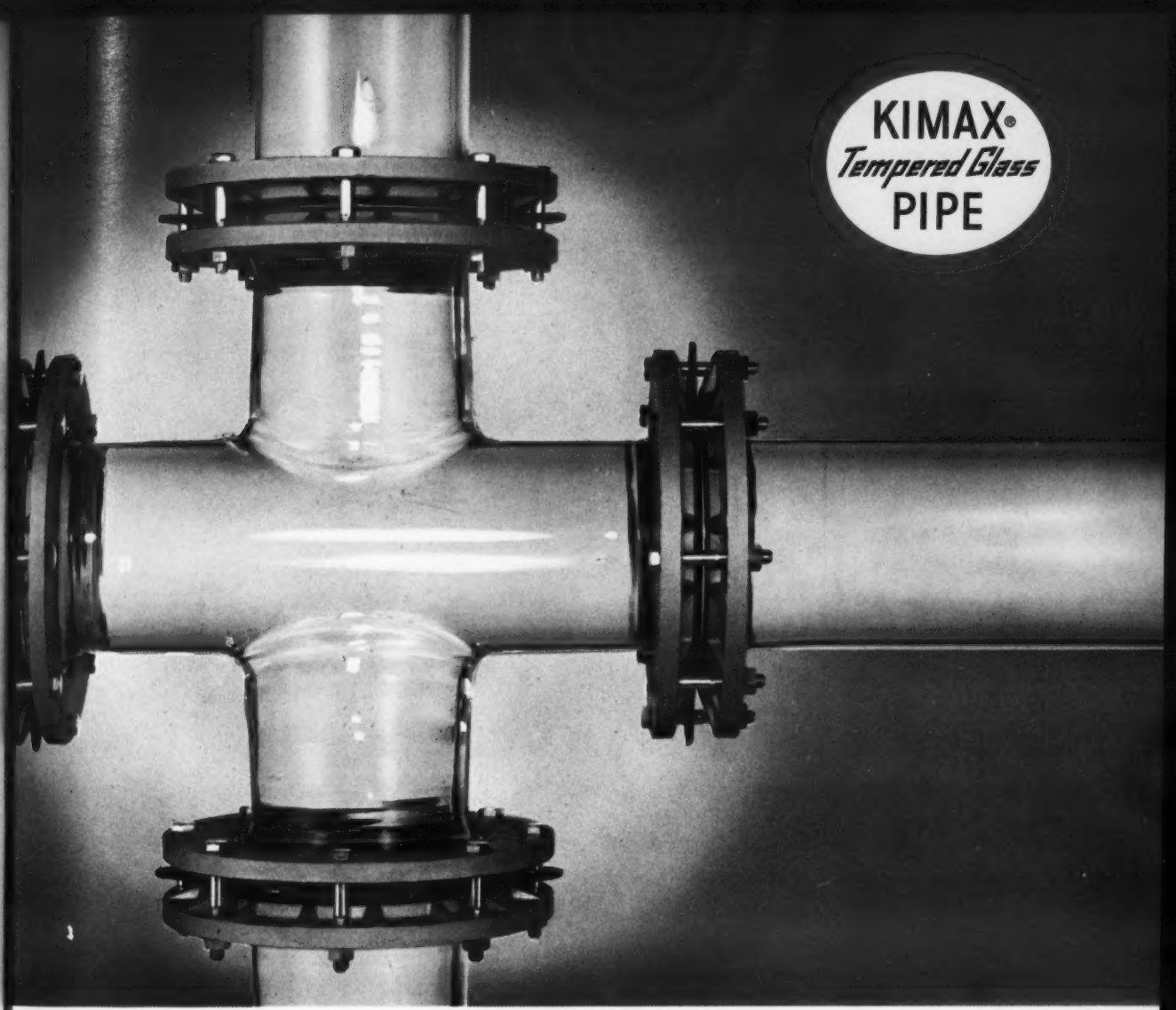
Designation of **Ralph A. Clark** as vice president and member of the board of directors of J. T. Baker Chemical Company places new emphasis on long-range growth by acquisitions and foreign ventures, which will be his responsibility. Other J. T. Baker promotions include: **Leroy S. Meckley,** vice president and director of manufacturing and **Warren F. Schumacher,** vice president for sales, succeeding Mr. Clark.

Thomas R. Vaughan has been elected vice president and general counsel and **John C. Carrington** vice president of sales for Freeport Sulphur Company.

Diversification through acquisition and expansion and foreign development were cited as reasons for re-deployment of key Spencer Chemical Company personnel. New assignments include **Frank Pyle,** formerly vice president-plastics to vice president and assistant to the president with responsibility for Spencer's foreign activities, commercial development for diversification and nuclear fuels program; **Harold Dinges,** from vice president-industrial chemicals to vice president-plastics; and **Byron Kern,** from vice president-agricultural chemicals to vice president-agricultural and industrial chemicals.

D. H. Francis has been named manager of all chemical products production for The Good-

For more information on product at right, specify 4882 . . . see information request blank opposite last page.



Your product stays pure... because KIMAX resists corrosion!

Do your present process pipe lines guarantee the purity of your product? If not, consider KIMAX Tempered Glass Pipe.

It resists corrosion and pitting — tiny particles cannot lodge. Smooth inner walls discourage build-up of scale and residue.

It has amazing resistance to impact damage and easily withstands sudden temperature differentials from steam to cool liquids.

KIMAX Glass Pipe is serenely indifferent to the savage attack of most acids and alkalis.

Since glass is inert, nothing is ever added to or taken away from your basic product.

Stoppages in the line can be spotted in seconds and remedied almost as quickly and easily.

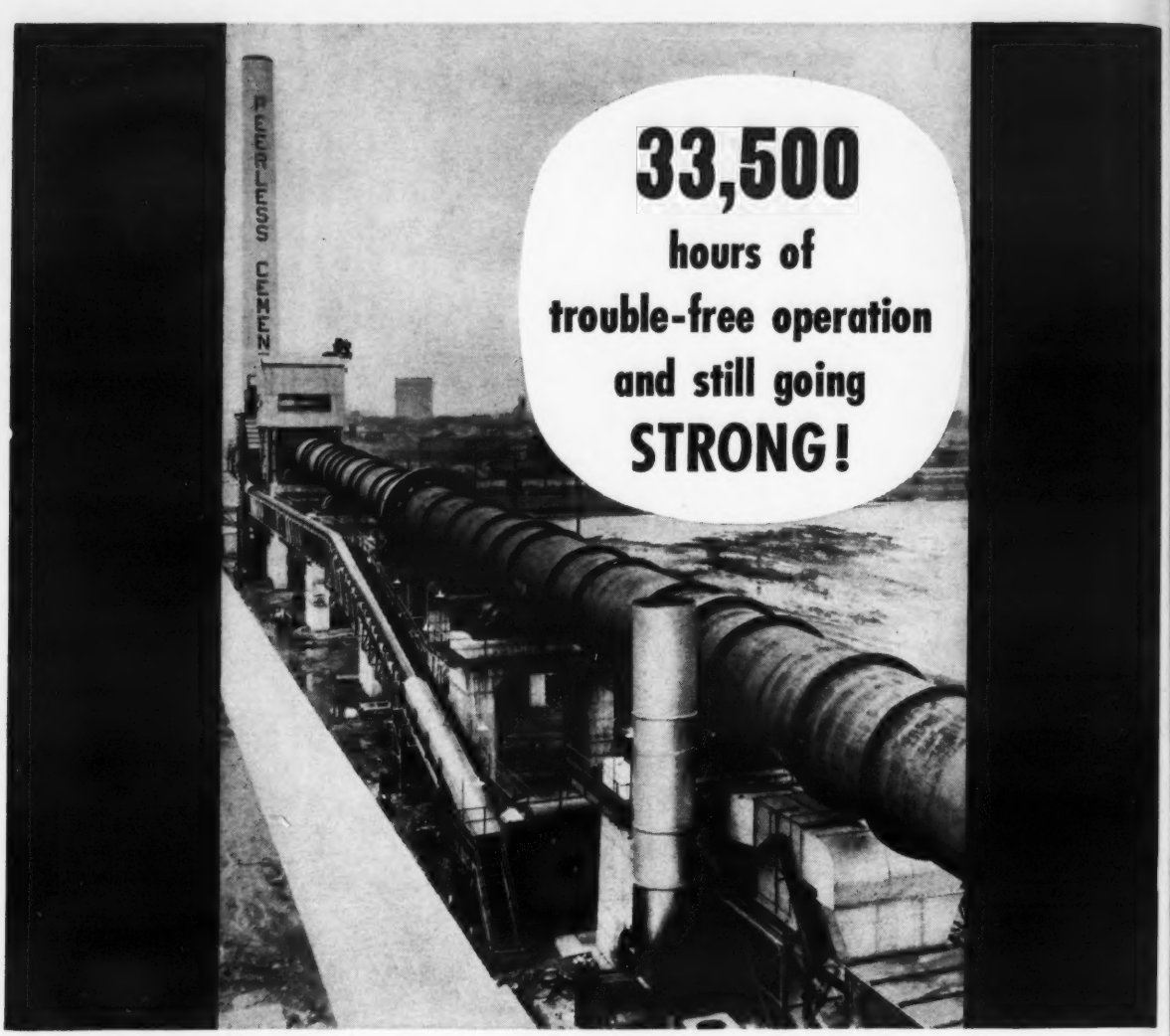
And KIMAX Glass Pipe is economical . . . initial costs compare favorably with other pipe materials. Installation cost is usually less and maintenance cost is practically nil.

For more information about KIMAX Glass Pipe write Kimble Glass Company, a subsidiary of Owens-Illinois, Toledo 1, Ohio.

Distributed in the U. S. and Canada by Fischer & Porter Company, Warminster, Pa.

KIMAX TEMPERED GLASS PIPE
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO



Typical performance of a **TRAYLOR** rotary kiln

Installed in 1956 at the Peerless Cement Company's Brennan Avenue plant, Detroit, Michigan, this 11'6" x 425' kiln has averaged 23 hours of operation a day without costly downtime. Traylor engineers, intimately acquainted with the problems and needs of the cement industry, painstakingly research and design each kiln to do its specific job. That's why Traylor kilns are noted the world over for minimum downtime and maximum years of profitable operation.

TRAYLOR ENGINEERING & MANUFACTURING
DIVISION OF FULLER COMPANY
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Canadian Mfr.: Canadian Vickers Ltd., Montreal, P. Q.

TKA-10

Check 4883 opposite last page.

year Tire & Rubber Company. Francis, now general manager of Goodyear Atomic Corporation at Portsmouth, O., will assume his new duties January 1, 1961. These include responsibility for plants at Houston, Tex., Niagara Falls, N.Y., Mt. Pleasant, W. Va. and Akron.

Paul E. Geiser has been promoted to the newly created position of general manager of petrochemical manufacturing for Continental Oil Company. Formerly manager of the detergents division, he will continue to make his headquarters in Houston.

Whittaker, Clark & Daniels, Inc., has advanced **Robert G. Smith and John Seidler** to vice presidencies.

Mobil Chemical Company in a move pointing up expected growth of chemical ventures in the Southwest and particularly at Beaumont, Texas, has appointed **Eber H. Peters,** manager, southwest manufacturing, of the basic petroleum chemicals division. His headquarters will be at Beaumont.

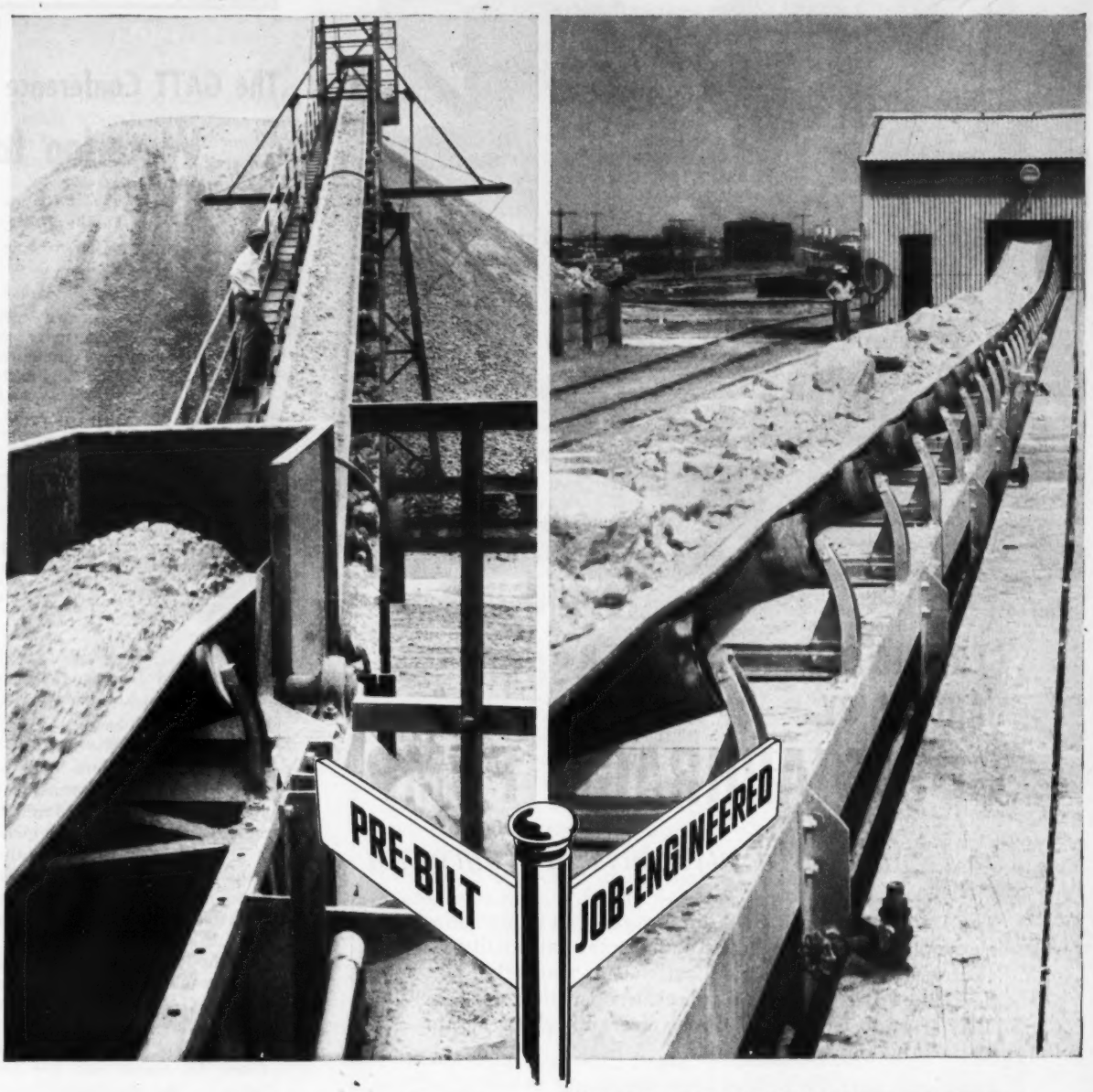
Ira E. McKeever has been appointed general manager of sulphur operations of Texas Gulf Sulphur Company.

The Enjay Chemical Company, a division of Humble Oil & Refining Company, has split its former Chemicals Division into two new product divisions — Industrial Chemicals and Chemical Raw Materials.

J. Kenneth Craver has been appointed manager of plastics development for Monsanto Chemical Company's Research & Engineering Division at St. Louis, after serving as manager of organic chemicals development for that division at Dayton. **Milton Kosmin,** has been named manager of organic chemicals development for the company's Research & Engineering Division at St. Louis.

Clifton C. Candee has been elected a vice president of Holland Color and Chemical Company, a subsidiary of Chemetron Corporation.

Choose your route to lower handling costs



Modernize for greater profit with a LINK-BELT belt conveyor system

BELT conveyors have proved themselves the giant of industry for low-cost, bulk materials handling. And additional benefits offered by Link-Belt contribute even more to this inherent economy.

LINK-BELT PRE-BILT SECTIONAL BELT CONVEYORS are pre-engineered . . . avoid need for detailed drawings. From standardized data, Link-Belt engineers prepare "on-the-site" quotations. Interchangeable, standardized parts speed selection, reduce purchasing costs.

LINK-BELT JOB-ENGINEERED BELT CONVEYORS. As a single source for design, equipment and erection of these systems, Link-Belt spares you coordination problems involving drawings and equipment . . . prevents waste of your engineering manhours.

For full details on both types of conveyors, contact your nearest Link-Belt office. Ask for 40-page Pre-Bilt Catalog 2779. 15,022

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BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

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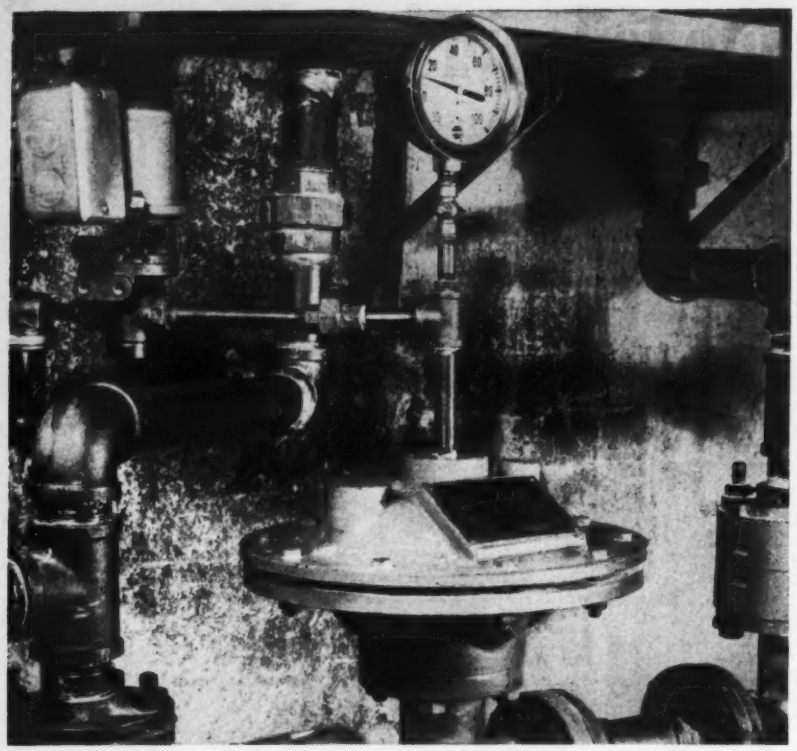


CERAMIC SLURRY TRANSFER HANDLED BY

ODS DIAPHRAGM PUMP

at Leviton Manufacturing Company

The 1½" rubber lined ODS diaphragm-type pump shown above plays a key role in the manufacture of quality electrical wiring devices at Leviton Manufacturing Company's Brooklyn, N. Y., plant. In operation since early 1958, the unit handles an abrasive ceramic slurry on its way to the glazing operation.

For tough, abrasive and/or corrosive slurry handling service, the ODS has been proven hard to beat. The diaphragm is operated pneumatically, requiring no mechanical linkage that can be a source of leaks and maintenance problems. A wide range of construction materials and linings is available.

Materials handling ability ranges from clear liquid to slurries containing up to 85% solids. Bulletin No. 5030 gives complete information . . . for your copy, write Dorr-Oliver Incorporated, Stamford, Connecticut.

ODS, TM Dorr-Oliver Incorporated

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

Check 4885 opposite last page.

Watching Washington

The GATT Conference — Waterloo for Protectionism?

By JOAN MARZIOTTI

Resurgent foreign economies and mounting pressures from the U.S. Government and certain elements of U.S. business have double-teamed believers in strong protective tariffs up against the wall in recent months. Protectionists face the fight of their lives in attempting to win to their side the U.S. negotiators for the January GATT Conference.

Compete or go out of business, says the Committee for a National Trade Policy. True reciprocity is impossible, retorts the Trade Relations Council. The stage is set for a knock-down drag-out battle between the philosophies of protectionism and free trade. The results will have strong repercussions in the CPI.

If it's a gloomy winter in the Villa le Bocage — Swiss headquarters of the GATT — a lot of the gloom can be attributed to apprehension about the upcoming January meetings which will comprise a general round of negotiations for new tariff concessions, as well as negotiations with countries wishing to accede to GATT.

Complicating the work of staffers and negotiators from the 37 GATT member countries has been the recent spawning of several economic blocs. Of these, two are notable — the six-nation European Economic Community (EEC) made up of the Benelux nations, France, West Germany and Italy, and the seven-nation European Free Trade Association (EFTA) spearheaded by the United Kingdom in cooperation with the Scandinavian countries, Austria, Switzerland and Portugal.

Caught in this economic maelstrom are the American manufacturers, many of whom find themselves in a squeeze between declining export markets and the increasing impact of competitive imports.* A number of these U.S. companies are developing a case of corporate schizophrenia because they either are increasing their ownership and operation of plants in a number of other nations, or have worked out attractive deals with a foreign country.

European Market Potential Is Free-trade Goal

A comparison of the vehicles representing the free-trade view and the protectionism outlook is interesting. For instance, the Committee for a National Trade Policy represents those in favor of a more liberal trade policy. It sports a blue-chip board of directors with a good sprinkling of representatives from the chemical-processing industries. They want us to stay in the General Agreement on Tariffs and Trade. Their view is that, if the members of the EEC move

*For the U.S. CPI as a whole, exports scored an 8.9% gain in 1959 over the 1958 total. Many segments of the industry were, however, badly hurt in the export market. Chemical imports to the U.S. during this same period jumped 24.2%. See "Chemical Producers Temper Views on Protective Tariffs," August CP, p. 27.

toward low tariffs, there will be a new burst of economic development of benefit to both Western Europe and North America.

But, and it's a BIG but, the Committee feels that EEC countries will not make substantial tariff concessions to other countries on a "most-favored-nation" basis, *unless* America is prepared to make substantial reductions in its own tariffs. In short, they reason that whether or not free trade in Europe will lead to freer world trade depends in large measure on U.S. trade policy.

Compete or get out—What if an industry gets hurt under a more liberal trade policy? Too bad, says the Committee for a National Trade Policy; "Ways and means should be devised to ease the transition of workers and facilities to other more economic pursuits." Their theme: If you can't compete, get out of the business. So say those favoring a more liberal trade policy.

U.S. Plants Go Abroad To Serve Our Market

On the other hand, the Trade Relations Council — speaking for those favoring at least the present amount of protection — feels that, if the U.S. follows a course of still further liberalization (and we are heading that way), the net result will be a shift by many industries from manufacturing in America for the domestic market to importing from U.S.-owned plants abroad to serve the home market. They see the trend in this direction as being quite clear. If it continues, maintains the TRC, "The American worker will lose and so will the American economy."

True reciprocity impossible?—Those in favor of maintaining at least the status quo hold that we can't possibly get true reciprocity in the forthcoming negotiations, and we probably won't be able to make up any of our present net deficit. Their reasons:

1) Lack of bargaining power—Even a further maximum reduction of 20% of present rates permitted by U.S. law is no great inducement to the EEC or EFTA countries to offer meaningful counter-concessions. Conversely, the 20% cut (if adopted) might be the breaking point for several American industries.

2) Regional blocs—European Economic Community, European Free Trade Association, British Commonwealth preferences, Latin American economic integration and Asian compacts are dividing the

GATT: Why & What

The essential element of the General Agreement on Tariffs and Trade (GATT) story has been world-wide cooperation among member countries in lowering trade barriers among themselves and accepting a code of practical rules for fair trading in international commerce. Currently there are 37 contracting parties. Together, they account for over 80% of world trade.

As a result of four tariff-bargaining conferences which have been held between 1947 and 1956, duties on tens of thousands of products have been reduced. It is estimated that, under GATT, tariffs have been reduced on products accounting for approximately one-half of world trade.

At the last conference, held in Geneva in 1956, the import trade in items affected by agreed-upon concessions was estimated at about $5 billion.

U.S. participation in the January GATT negotiations is authorized by the Trade Agreements Extension Act of 1958.

Life in these excited states...

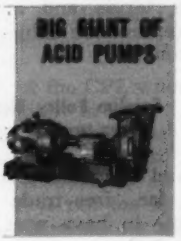
"Have you seen the pipe inspector?"

How Ace keeps you out of the tight spots

We admire men who jump right into the tough problems, but our business is eliminating problems completely. That is, problems of corrosion and contamination in piping, valves, pumps, tanks, and the like. Good equipment keeps you always in the clear. Our 108 years of experience is at your service.

Ace chemical-resistant rubber-lined steel pipe best for high-pressure, big sizes, or abrasives. Pipe, fittings and valves 1½ to 24".

Highly efficient *WE* pump. Capacity to 360 gpm. Cast iron, fully protected by top quality, chemical resistant hard rubber lining.



Design assistance and facilities for molding special fittings, pump parts, etc., of plastics or hard rubber. Also large hand-fabricating facilities.

Variety and quality to match *any* plastic piping. Riviclor PVC, Ace-Ite rubber-plastic, Parian poly, Ace Saran, Tempron high temperature nitrile, hard rubber-lined steel.

ACE *chemical resistant equipment*
BY **AMERICAN** HARD RUBBER COMPANY
DIVISION OF **AMERACE** CORPORATION
ACE ROAD · BUTLER, N.J.

See ACE equipment in Chemical Engineering Catalog

Check 4886 opposite last page.

world into regional trading groups dedicated to creating mass markets . . . and mass industries to serve those markets. While the objectives are laudable they tend to discriminate against the outsider, and the U.S. is outside all of them.

3) Underdeveloped countries cannot bargain—Those nations operating under the GATT which are now in one stage or another of economic development are in no position to make concessions. What they, of necessity, want is one-way shot at our markets. In even return for this they will join with us in defensive alliances, but won't bargain on tariffs.

4) Tariffs only part of problem—Tariffs themselves are only half the apple in foreign trade. They aren't even the chief obstacle to the export of American goods. The most effective barriers to our products are quantitative restrictions such as import quotas, currency licensing practices and state trading. None of these problems will be negotiated in January. As a matter of fact, under GATT rules only tariffs and margins of preference are subject to bargaining.

Foreign Policy Dictates Free-trade Moves

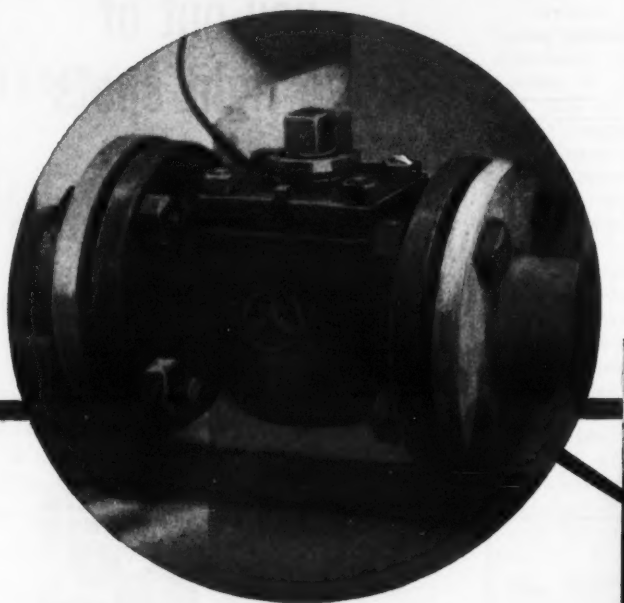
And thus the scene is set. So far, free-trade thinking seems to have won the day. The U.S. is considering tariff cuts on a wide range of chemical products—from synthetic resins, vitamins, man-made textiles, coal-tar dyes and colors, and photographic chemicals . . . to certain petrochemicals and some medicinals. At the same time our negotiators have been asked to seek foreign duty cuts on synthetic rubber, certain synthetic fibers, potash and other products.

The reason for this reversal of the historical U.S. protectionism position is as much a matter of over-all foreign policy as it is trade policy. America is committed to freer trade, to offer encouragement to underdeveloped countries, to offer a marketplace, and to enter into trade relationships.

PENTON® COATINGS

A simple solution to your complex

CORROSION PROBLEMS



PENTON MAKES TUFLINE VALVES TOUGHER

Tufline valves in sizes from ½" to 2" with a CORVEL*-Penton coating are made by Continental Manufacturing Company, Cincinnati, O. The coating was applied by the WHIRLCLAD* customs coating service of The Polymer Corp., Reading, Penn.

**Trademarks of The Polymer Corp.*

Though many corrosion problems may seem complex, a Penton coating can often supply a simple answer. Economically applied to low-cost metal substrates, Penton provides a tough, pinhole-free barrier against corrosion at elevated temperatures.

A typical example is this Penton-coated TUFLINE plug valve, successfully serving in the discharge and filling line of a 20-Baume muriatic acid installation where even expensive metals could not withstand the corrosive exposures involved.

Durable Penton coatings for valves, pipes and fittings, and pump and meter parts ranging in thickness from 10 to 40 mils, can be achieved by various techniques. They provide excellent protection against the corrosive attack of acids, alkalis and solvents, both to exterior surfaces and interior wetted parts.

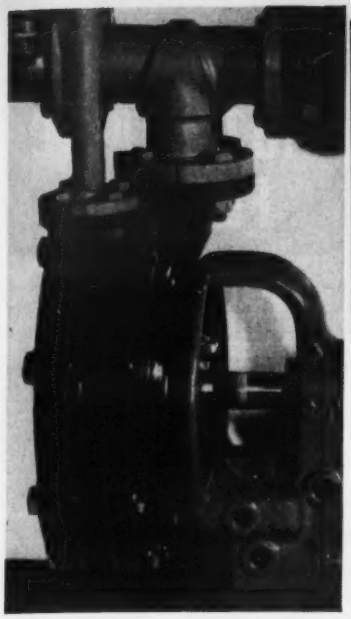
Penton, chlorinated polyether, is a modern engineering material with an established record of success in combating today's toughest corrosion problems. Easy to mold or fabricate, it can serve as a coating or liner for metal, or be used in solid molded form.

Want to learn more about Penton? Write for your copies of "The ABC's of Penton for Corrosion Resistance," which cites data on Penton's chemical resistance to more than 300 reagents, and "The Penton Buyer's Guide," a complete listing of fabricators and suppliers of Penton processing equipment.

HERCULES POWDER COMPANY
INCORPORATED
Hercules Tower, 910 Market Street, Wilmington 99, Delaware

CP60-13

Check 4887 opposite last page.



Protect your processing equipment from **corrosion** with **CORVEL®-Penton† Coatings**

▲ This pump has a 25 mil Penton coating applied by fluidized bed process to pump impeller and both the inside and outside of pump head, providing internal protection against corrosive fluids as well as an exterior surface finish resistant to corrosive atmosphere.
(PHOTO COURTESY GOULDS PUMPS, INC.)

Flowmeter coated with CORVEL-Penton provides high-order corrosion resistance for use in a wide variety of chemical atmospheres that attack metals. ▶
(PHOTO COURTESY BROOKS ROTAMETER CO.)

Iron pipe and flanges coated with CORVEL-Penton on internal and external surfaces.

WHIRLCLAD® Custom Coating Service

CORVEL-Penton provides ideal, high order corrosion protection for valves, pumps, flow meters, pipe and fittings in the chemical, food and other processing industries. Because of their excellent resistance to almost all acids, alkalis, solvents and chlorides, CORVEL-Penton coatings on low cost metals are unmatched in performance and economy . . . competitive in cost with low order corrosion protection.

Penton coatings operate in temperatures to 250°F. and over. The wear and abrasion resistance of the coatings imparts excellent durability to parts operating under corrosive conditions.

In Polymer's WHIRLCLAD custom coating service, Penton is applied to valves, pipes and processing equipment in the WHIRLCLAD coating system‡, utilizing a fluidized bed of dry, finely divided resin powders. The powders heat-fuse to form a uniform, continuous film with thorough coverage of edges, corners and projections on complex shapes. Pin-hole-free coatings are readily obtained in thicknesses of .010" and over. Coatings of vinyl, polyethylene, cellulosic, nylon and epoxy are also available.

- **Nationwide coating facilities**
- **Specialized application techniques**
- **Experienced engineering assistance**

‡The basic fluidized bed process was developed and patented in Germany. Polymer's WHIRLCLAD coating system which encompasses the fluidized bed technique is protected by various apparatus and process patents in the United States and foreign countries and numerous applications are pending. Exclusive patents and licensing rights in the United States and Canada are owned by a subsidiary of The Polymer Corporation.

WRITE FOR BULLETIN CP-1

POLYPENCO *industrial plastics*

CUSTOM COATING SERVICE
WHIRLCLAD Division
The Polymer Corporation
Reading, Pennsylvania

Other Custom coating facilities: Santa Ana, California
Rolling Meadows, Illinois

†Trademark of Hercules Powder Co.

Check 4888 opposite last page.

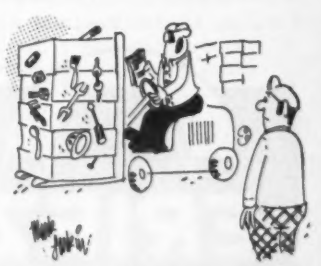
If protectionism as a U.S. policy meets its demise this winter in Switzerland, a heavy toll may be exacted from American industry in the years to come.

No longer do we have a productivity advantage over the rest of the world. In many areas foreign productivity rates are as high as ours; often it is U.S. machinery and technology that make the wheels go 'round. With equality in productivity, the foreign country (paying as low as $0.40 per hour for labor, as against $2.31 in the U.S.) has a substantially lower unit cost and can undersell the American manufacturer.

Unquestionably we are carrying water on both shoulders; sooner or later some of it is going to spill. Some producers may be driven out of certain product areas. Others will initiate or expand overseas production facilities. As far as the chemical industry is concerned, some of its 846,000 employees may be out of work.

Another prime potential sacrifice is the danger of eliminating or transferring abroad productive facilities which may be important during time of war.

Leaders of the CPI, whether for protection or for freer trade, must carefully evaluate the concessions made to date and their true effect on the economy. It is not too late to change the handwriting on the wall. As bargaining sessions are reported, transmit your views either to your Congressman or directly to the GATT negotiators. ■



"Where do you want this magnetic tape?"
Mark Larkin, Electra Mfg. Co.

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PLATE MAGNETS
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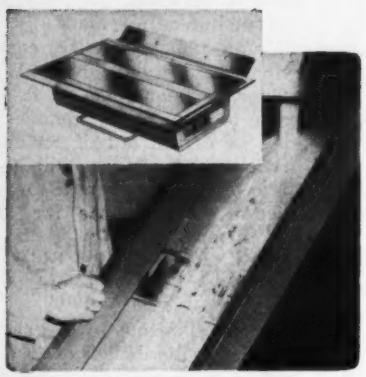
New Construction and Design ...New Magnetic Power



Protect your machinery and production. Safeguard your product quality and reputation. Eriez Series 17 Plate Magnets can pay for themselves many times over in many ways.

All welded steel and stainless steel construction is standard on these all-new plate magnets in every model. They're more compact and rugged than previously available models . . . and designed to assure ease of installation in chutes, spouts, ducts, feed tables, and housings; and for suspension over screens, moving conveyors, etc. Wide mounting flange for better, easier dust-tight installation. Uniform dimensions for greater interchangeability.

Tops for performance because of their Erium-powered* magnetic circuit providing intense concentration of power in the most essential areas (three strengths available).

**Erium—an exclusive, high quality permanent magnetic power source specifically designed and energized by Eriez.*

Here's the finest, most versatile plate separator performance at the lowest dollar cost. Write today for complete data on Series 17 Plate Magnets to:

Eriez Mfg. Co., 73-KA Magnet Drive, Erie, Pa.

ERIEZ

Check 4889 opposite last page.

Plastics Play Big Role In Auto Industry

HARRY LAUBSCHER, Analyst
Hornblower & Weeks

To capture public acceptance of new cars, manufacturers have turned to new materials such as plastics, for appearance improvements.

Plastics in autos have come a long way since cellulose nitrate first was used in curtains for protecting Sunday drivers from the elements. Today, acrylic and phenolic plastics, nylon, polyvinyl butyrals and the copolymers, vinyl and urethane are used in almost every part of the average car — from seat backs and crash panels to electrical systems and clutch facings.

Progress has been so dramatic that it is little wonder industry is considering plastic bodies. Many 1961 models will use finishes that greatly reduce need for waxing and polishing. Plastics are playing an increasing role in paints.

In 1944 total weight of plastics used in the average General Motors car was 3.84 lb; in 1959 models the average had risen to 10 lb. By 1963, the quantity of molded thermoplastics alone in automobiles is expected to reach 15 lb per car.

The big increase will come in urethane foams. While Detroit as yet has not switched to urethanes on a major scale, the auto makers in 1959 used some 15 million lb. Potential consumption over the next few years appears substantial. The variety of uses for urethane foams is so extensive that, in the automotive industry alone, annual consumption is expected to grow from 15 million lb currently to 60 million lb by 1964.

Dow Chemical—New automotive styles will be strongly influenced by research work in chemical laboratories such as those at The Dow Chemical Company. Machinery at Dow is now tailoring particular plastics to do jobs done by other plastics and to do these jobs at lower cost.

Example: Zerlon (methyl methacrylatestyrene copolymer), produced by Dow for tail, parking and signal lights and instrumental dial faces. Acrylic was formerly the only plastic with adequate weather characteristics and clarity for such applications. Zerlon performs satisfactorily at a lower price than acrylic.

Growth in plastics usage will continue to benefit Dow whose research laboratories are developing several new products. Sales increased approximately 11% last year to $705.4 million and are expected to reach a new peak this year. Debt has been substantially reduced from fiscal 1959's $274.6 million to $172.3 million as of May 31, 1960. Earnings for year ending May 31, 1961 are projected at $3.15 a share on a sales volume of $820 million.

Rohm & Haas—The leading position in the field of acrylic plastics is held by Rohm & Haas. This well-run company has an excellent record, based to a large extent on its being one of the pioneers in the plastics industry. Sales this year are expected to reach $240 million, against $215.9 million in 1959. Earnings should score a moderate gain to about $23 a share, compared with 1959's $20.51. With the market for newly developed Implex and other plastics expected to broaden significantly over the coming years, a continuing enlargement of dividend payout can be expected.

(For further information on chemical stocks write Hornblower & Weeks, 40 Wall St., New York 5, N.Y.)

Check 4890 opposite last page.

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from ounces to tons per hour

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HI-VI
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Only feeders with totally enclosed drive element as standard construction. A-C operated, electro-permanent magnetic drive

Continuous, uniform flow of feed of all sizes and shapes of bulk materials for blending, mixing, sorting, cooling, etc. Variable feed rate. Completely automatic, extremely accurate. Increases production, provides quality control, reduces maintenance and operating costs.

Fully enclosed drive element (standard—no extra cost) makes units dust and moisture resistant; ideal for sanitary applications. Break-resistant glass fiber springs • New patented magnetic drive provides greater feeding capacity than comparable size units • No rectifier needed • Simple installation • Factory pre-tested • Fully proved in plants everywhere

NOW AVAILABLE! . . . economical, specially constructed units for hazardous dusty locations . . . fully acceptable by Mill Mutual.

WRITE FOR FREE COMPREHENSIVE LITERATURE
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ERIEZ

Check 4891 opposite last page.

Chemical Processing Nomographs

The following reviews of the book, "Chemical Processing Nomographs," were recently received from two of our readers in Bailey Island, Maine. They are offered without comment.*

Here's something of a rarity in the nomographic field: an anthology of practical, up-to-the-minute alignment charts strongly fortified with simple, clear directions on how to design and construct these invaluable aids to the chemist and engineer.

This reviewer was especially pleased to see the attention accorded the viscoisties and vapor pressures of ethyl acetate and ethylene glycol. The chart that deals with free energy and entropy is most welcome.

SYLVAD S. ELAD

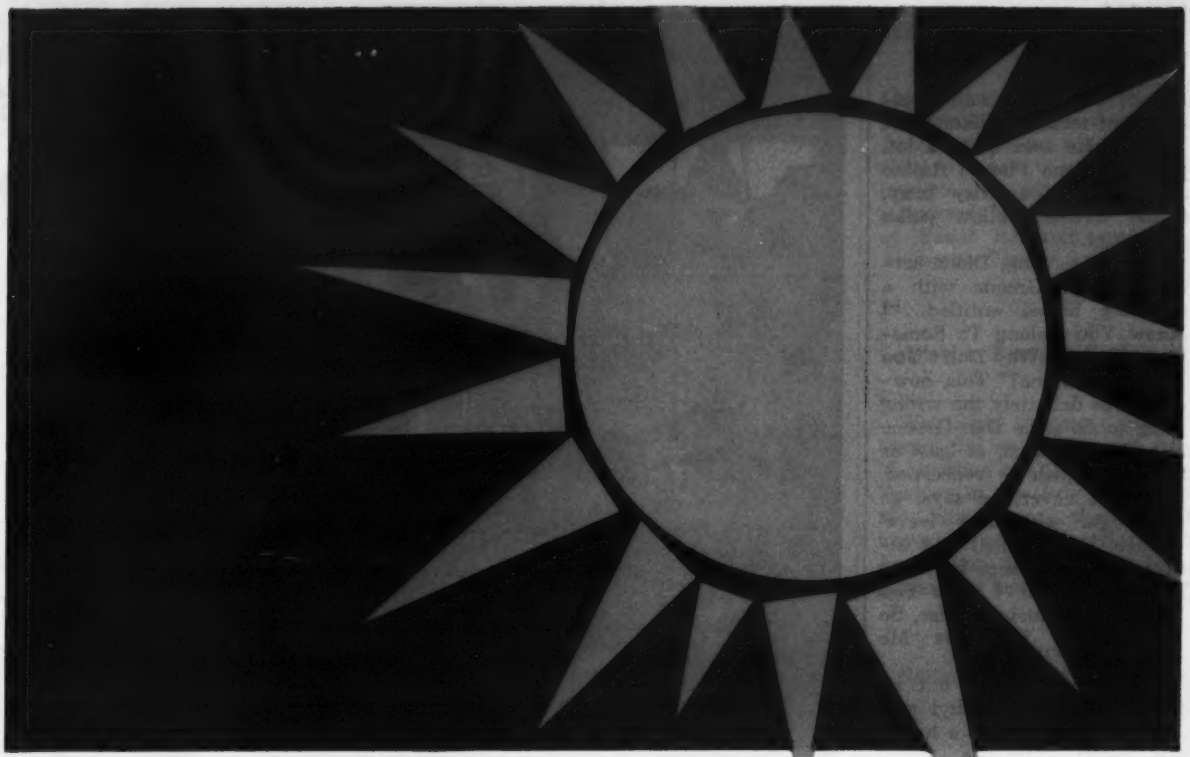
Bailey Island, Me.

Even the author-editor admits that the plot of *Chemical Processing Nomographs,* is regrettably weak. Some of the characters don't have names at all and are known only as x, y and z. The story is all about a couple of twins (twins *come* in couples, it seems) whose names are Ethyl and Ethylene. Ethyl is the stouter one; Ethylene, as you can readily guess, is a little on the stringy and thin side.

Well, Ethyl has been ill and her viscosity has been low. Her boy friend, Dan Greene, has developed a roving eye. Ethylene (the little minx) on the contrary has a high vapor pressure. She's all steamed up and is r'arin to go—out with Dan Greene, interne at the local hospital, whose internal energy *and* entropy are approaching maxima.

Dan isn't much interested in either Ethyl or Ethylene, although he is something more than half engaged to the former. He has spotted Diana

* "Chemical Processing Nomographs" is a cloth-bound collection of 165 of the best charts which have appeared in the pages of CHEMICAL PROCESSING. Copies are available at $12.00 each from Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N.Y.



2-NITROPROPANE!

The remarkable solvent that brightens the day for more and more hard-working formulators.

2-NP ($CH_3CHNO_2CH_3$) is an extraordinarily versatile member of the CSC Nitroparaffin family. Its most important property is its strong solvent power for a wide variety of materials including many natural resins, synthetic resins, coating materials, dyes, organic chemicals and fats and oils. Of special interest is the co-solvent effect of 2-NP and/or toluol and alcohol, making it an outstanding solvent for many vinyl resins and acrylics. It is a superior solvent for epoxies and cellulosics.

2-NP is to the newer coatings what butyl acetate has been to nitrocellulose — an ideal solvent. 2-NP's evaporation rate permits maximum flow and leveling without delaying drying time.

Unlike ketones, 2-NP in vinyls eliminates problems of solvent residue and solvent odor, too. It has several safety features such as relatively high flash point and a high lower-flammability limit of vapors in air. Write for all the literature that details how CSC's 2-Nitropropane can brighten your day.

Evaporation Rate of 2-NP Compared to Other Solvents (volume)

Acetone	975
MEK	568
Toluol	197
MIBK	186
2-NP	110
n-Butyl Acetate	100
Xylol	69
Cellosolve	38
Isophorone	4.3

Flash Points (°F Tag Open Cup) of 2-NP Compared to Other Solvents

Acetone	16
MEK	30
Toluol	56
MIBK	81
Xylol	85
n-Butyl Acetate	92
2-NP	103
Cellosolve	126
Isophorone	202

Comparison of Lower Limit of Flammability of 2-NP With Other Solvents (% by volume in air)

MIBK	0.9
Xylol	1.0
Toluol	1.27
n-Butyl Acetate	1.7
MEK	1.8
Acetone	2.15
2-Nitropropane	2.6
Cellosolve	2.6

INDUSTRIAL CHEMICALS DEPARTMENT

COMMERCIAL SOLVENTS CORPORATION

260 MADISON AVENUE, NEW YORK 16, N. Y. • OFFICES IN PRINCIPAL CITIES

Check 4892 opposite last page.

Phenyl Amine in some outside spot tests and likes what he sees. He sees quite a lot, too, for Diana Phenyl Amine always wears an itsy bitsy, teenie weenie, yellow polka dot bikini.

Barely crooning, Diana serenades Dan Greene with a touching ballad entitled, "I Know You Belong To Somebody Else, So Why Don't You Leave Me Alone?" This, however, was definitely the wrong thing to do since Dan Greene is a Boston purist, at least as far as English is concerned. He could never, he says, go for a gal who uses 'leave' (where 'let' belongs) and insists that she change her tune or her words to "I know You Belong To Somebody Else, So Why Don't You *Let* Me Alone?"

Everything turns out all right in the end: Ethyl gets Dan Greene and dies a horrible death. Ethylene elopes with a Fuller Brush man to whom she was unable to give the old brush-off, and Diana Phenyl Amine gets a job with an advertising agency thinking up new grammatical atrocities such as "Punkos taste good *like* a cigarette should."

MARGARETHE D. BRAUN

Bailey Island, Me.

Electrophoretic separation

Sirs:

We were intrigued by the article which appeared on p. 150 of the July 1960 edition of your magazine ("Electrophoretic technique separates solutions within seconds").

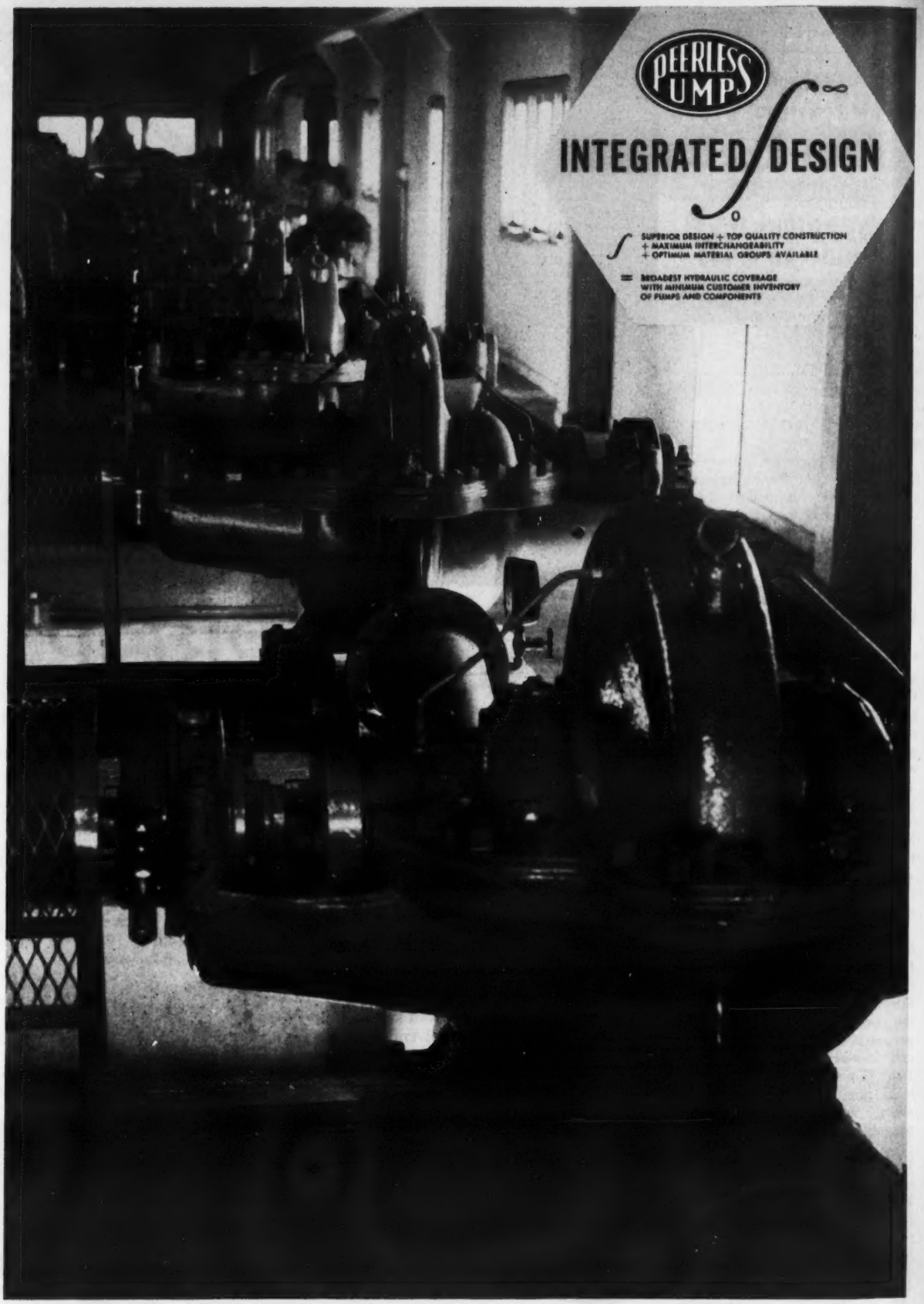
We would be interested in obtaining additional information concerning this process, and are requesting the specific information as to who to contact at the University of California for this information.

J. C. GILLESPIE

Laboratory Division Union Carbide Nuclear Corporation Division of Union Carbide Corporation

Paducah, Ky.

Dr. Alexander Kolin, bio-



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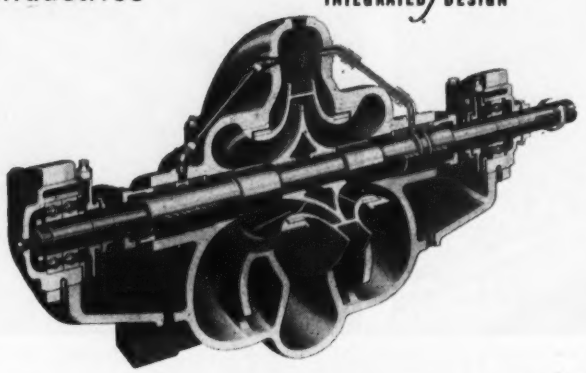
Optional construction features quickly adapt this Peerless horizontal centrifugal unit to many pumping applications in the process industries

Naturally, when selecting pumps for all your plant requirements, you look for quality equipment: Sound design and best materials mean optimum performance, longer life, higher efficiency, lower operating cost; less maintenance, fewer shutdowns and repairs. Peerless Type A pumps give you all these advantages and more: Simplified construction and maximum interchangeability means broadest hydraulic coverage with minimum inventory of pumps and parts. The Peerless Type A pump can really do an "A Plus" job in any number of situations calling for moving water, hydrocarbons and other nonabrasive fluids in your plant. Ideally suited for transfer, booster, recirculating services, as well as maintaining line pressures, the Peerless Type A pump is a good pump to know more about. Peerless Type A pumps are also available in ductile iron. So be sure you get the facts on this versatile line for your plant. Send for the highly informative bulletin No. B-1300 today.

INTEGRATED DESIGN



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The Mechanical construction of the Type A pump is superior as is its hydraulic characteristics. Oversize shafts, heavy duty ball bearings, modern design wear rings and shaft sleeves all contribute to ample protection against wear. Bearing seats are cast and bored integral with pump case assuring permanent alignment. Impellers are hand finished inside and balanced for accuracy. And all parts are machined to gauge in an interchangeable parts system that permits substantial reduction of part inventories.

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Send me Bulletin B-1300 ☐ Have field engineer contact me ☐
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CP

Check 4893 opposite last page.

physicist at the University of California, has been doing the development work on the electrophoretic-separation process. His work has been supported by both the Office of Naval Research and the American Cancer Society.

Corrosion Feature Kudos

Sirs:

We think CHEMICAL PROCESSING did an exceptional job of handling the Corrosion Feature in the July issue (p. 27). Our sincere thanks for honoring again, the National Association of Corrosion Engineers in this way.

T. J. HULL
Executive Secretary
National Association of Corrosion Engineers
Houston, Tex.

Hygiene and rockets

Sirs:

May we have permission to re-print two items from the July issue of CHEMICAL PROCESSING in the JOURNAL OF EAST TENNESSEE SCIENTISTS? The two items are, "Are You Missing the Boat On Industrial Hygiene" (p. 35) and "More Zoom for Your Tax Dollar" (p. 152).

The JOURNAL OF EAST TENNESSEE SCIENTIST: is a new regional publication sponsored by the Technical Societies' Joint Council at Oak Ridge to serve as a medium for presenting articles of general interest to the 2000 or more scientists and engineers in this area. We believe these two articles will be of particular interest to these technically trained people.

ROBERTA L. MCCUTCHEN
Editor
JOURNAL OF EAST TENNESSEE SCIENTISTS
Technical Societies' Joint Council
Oak Ridge, Tenn.

We're always happy to grant such permission.

Another new development using

B.F.Goodrich Chemical *raw materials*

Complete acid etching machine of rigid Geon was developed by Industrial Plastic Fabricators, Inc., Norwood, Massachusetts. It is used by Corning Electronic Components, Corning Glass Works, Bradford, Pennsylvania, to produce Fotoform and FOTOCERAM® products like the circuit board shown. B.F.Goodrich Chemical Company supplies the rigid Geon vinyl.

Machine of rigid Geon produces low cost precision etching on glass

"Chemical machining" is the accurate term for the high precision etching on glass done by this new machine. Square-cornered, submicroscopic holes can be produced with small tolerances and close center-to-center distances. Or a precise pattern can be created in glass, whether it involves holes, cut-outs, or channels. Screens with mesh as fine as 560,000 holes per square inch have been produced.

The machine is made of shapes, sheets and rods made of Geon rigid vinyl. Geon is unaffected by the acids that do the etching job. It provides the durability and impact strength needed for fabrication. And it is as easy to handle as any material used for manufacturing.

Here's another example of the way Geon vinyl can open new markets or improve old applications. For more facts, write Department GO-9, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

B.F.Goodrich Chemical Company

a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Check 4894 opposite last page.

CREATIVITY & SURVIVAL

Survival of America hinges on creativity

Dr. George B. Kistiakowsky, who devised the trigger for the atomic bomb, has said that he doesn't think the United States can survive unless we change our attitude and do more to encourage intellectual pursuits and creativity. Other distinguished scientists such as James Bryant Conant, Glenn Seaborg, and Robert Woodward agree that the situation is critical and that more must be done to stimulate basic research and creativity.

The article on the facing page inaugurates a series of articles on one of the most important problems facing America today: fostering a higher degree of creativity. It is a subject that reaches into every facet of American life. Our discussions will be concerned primarily with the controversial question of creativity in the chemical industry, which plays such a comprehensive role in our economic well-being and national defense.

In this first article, the question is raised as to whether we can any longer afford to confine most of the basic chemical research to universities, private research institutions and the Government. Can we win the cold war unless the formidable resources of the chemical industry in technical manpower and wealth are not also thrown into the battle for basic knowledge in a bigger way?

In the second article, we will show what chemical companies are doing about the problem of creativity in industrial research. Later articles will cover how to test for creativity and suggest ways an individual can improve his own creativeness.

There is no doubt that the American chemical industry has been making tremendous strides and is recognized as the world leader. The magnitude and quality of much of the research work in this country is second to none.

Despite this, is U. S. industrial research working at its full capabilities . . . is it digging deeply enough to discover and interpret fundamental advancements?

Dr. H. C. Brown of Purdue recently voiced his concern publicly. CP since has queried a number of research leaders on the subject. We came away from these interviews with the disturbing thought that much of what Dr. Brown said is only too true . . . that industrial research is too often not facing up to its basic, creative challenge.

Is CREATIVITY lacking in industrial chemical research?

Comments made by Purdue's Dr. H. C. Brown and other eminent scientists point out that industrial chemical companies, in spite of spending $600 million dollars a year and using 25,000 technical men on research and development —

- **Are making only minor contributions to the *SCIENCE* of chemistry**
- **Capture few awards for individual creativity**
- **Place too much emphasis on empirical methods**

GORDON WEYERMULLER
Associate Editor, Chemical Business

Is something wrong with industrial chemical research in the U. S.? Is it conducted and directed properly? Does management really believe in its full capabilities?

American industrial chemical laboratories contain the greatest reservoir of research talent in the world. About 30% of the more than 80,000 scientists and engineers employed by the chemical industry are in research and development. Chemical companies spend an average of 3-4% of their annual sales for R & D — more than $600 million per year. Is this tremendous research program matched by the achievements obtained from it? Many R & D people themselves do not think so, despite the American chemical industry undoubtedly being the foremost in the world.

In a recent talk,* Dr. H. C. Brown, Purdue University, courageously focused attention on what he considers the failures of industry to meet the basic research challenge. For example, he feels that not many truly significant contributions are being made to the science of chemistry by industrial chemical research. Certainly, many patents are issued to the chemical industry every year, but how many of these are of such significance that they will appear in chemistry textbooks? Is the emphasis on quantity rather than quality?

Although the American chemical industry is second to none technologically, Dr. Brown is of the opinion that industrial research at present contributes only to a minor extent to the advance of chemistry as a science, particularly in the organic field. This disturbing view, we find, is seconded by a surprising number of research directors in chemical companies.

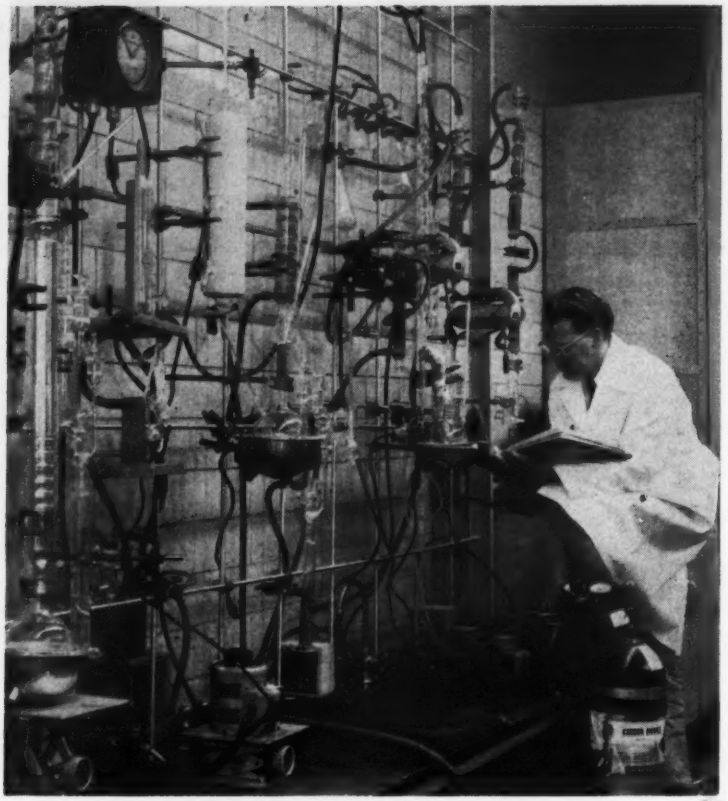
Dr. William S. Johnson, winner of the 1957 ACS Award for Creative Work in Synthetic Organic Chemistry agrees that creativity is lacking in many industrial laboratories. He thinks the ratio of important discoveries to man-hours in industrial laboratories is quite low. Dr. Johnson, who just became head of the Department of Chemistry at Stanford University, was formerly at the University of Wisconsin.

Dr. Gustav J. Martin, director of research, William H.

*The talk was given before the Society of Organic Chemical Manufacturers Association on June 14 when he received the 1960 Gold Medal Award for Creative Research in Organic Chemistry from the group. When asked to speak, Dr. Brown suggested several possible topics. It is to the credit of SOCMA that they asked him to talk on what is wrong with industrial chemical research.

CREATIVITY and research

From preceding page



Creativity in industrial research may well be the No. 1 problem facing the American chemical industry today

Dr. H. C. Brown of Purdue, winner of two awards for creative organic research in 1960. Many chemical R & D men feel that Dr. Brown has rendered a service to the chemical industry in his recent critique on industrial research

Rorer, Inc., says: "Creativity is one of the key issues facing the nation. The situation is critical. The very survival of the nation is at stake."

Awards for Creativity Go to Academic World

In addition to receiving the SOCMA Gold Medal in 1960, Dr. Brown was also the recipient of the 1960 Award of the American Chemical Society for Creative Work in Synthetic Organic Chemistry. This ACS creativity award is in its fourth year. In the previous three years it was also won by university people.

Other ACS awards for major contributions to the science of chemistry, such as that for pure research, established in 1931, tell much the same story. The winners seem to be pretty well confined to the academic world, with little representation from industry.

Outside of the Nobel prize, probably the highest honor a U. S. scientist can obtain is to be elected a member of the National Academy of Sciences. Of the 89 present members in chemistry, only half a dozen or so are from industry.

Room for Creative Research In Industry

Of course, some would say that these awards and membership in the National Academy are given for basic research and that only the very large chemical companies can afford to do basic research. Further, it can be said that chemical companies have the function of developing and manufacturing products that people can use. Their role is a commercial one.

These people might say that this so-called "basic research" should be left with the universities, private research institutions and Government. Certainly, there may be some valid points here. However, let's examine this thesis more closely.

First, Dr. Brown and many other research people do not like to differentiate too closely between basic, exploratory and applied research. Basic or fundamental research is the search for understanding. Exploratory research is the search for discovery. Applied research is that directed toward a specific objective. The three types overlap and one can easily become another type. Applied research can lead to momentous discoveries and basic advancements *if properly directed and executed.*

Serendipity Missing

It is Dr. Brown's thesis that the chemical industry conducts research toward such narrowly defined objectives that important discoveries made as a byproduct of the work are disregarded. Perhaps industrial researchers have never heard of the princes of Serendib and the wonderful things they found other than those they were seeking.

Is it too expensive for industry to pursue these discoveries? Many industrial research people say, "Yes," but Dr. Brown feels that it is *too expensive to disregard* them. He thinks the stockholders are not always getting full value for their investment in research.

There are noteworthy exceptions, of course. Dr. Wallace Carothers of Du Pont, in his program to make high polymers, which could be called applied research, first learned their basic chemistry. If he had used empirical methods, the money could well have gone down the drain to the disadvantage of the stockholders. Nylon and neoprene probably wouldn't have been discovered. Empirical research, or the trial and error method, such as is widely used in industrial chemical laboratories, can be a costly method of research.

Should the type of research that results in better understanding of chemistry be left with the universities, private research centers and the Government? Eminent scientists wonder if we can afford to do this.

Although it is no longer true, it used to be said that the Japanese only appropriated the ideas of others and put them to use. America is a long way from this, but there is considerable room for improvement. There is certainly nothing wrong with taking basic ideas from universities and foreign countries. However, there is a need for chemical companies to develop more fundamental ideas of their own.

Dr. Brown has done his work on new selective reducing agents and on the chemistry of organoboranes on an annual budget of around $60,000 with a small laboratory and a staff of nine co-workers, many of whom are graduate students who are still learning to do research. On a budget of this magnitude, he and Professor Schlesinger did the fundamental work on the synthesis of boron hydride at the University of Chicago which made these materials available for high-energy fuels and propellants.

Universities are now able to obtain adequate funds for research. The National Science Foundation has a plan for granting funds to universities and recently made an additional grant of two million dollars for needed equipment. Many other agencies now support research in universities.

However, the universities are being encouraged by the Government to undertake a number of applied research projects. Funds for such applied projects are far more ample than for exploratory or fundamental research. If they are distracted by this circumstance, there will be no place for the fundamental work to be done.

Surely the chemical industry, with its vast material wealth and technical manpower, might contribute much to the science of chemistry. Moreover, it is likely that such companies that undertake research with the view of understanding the chemistry of the problem will benefit financially.

A research director of a large chemical company in the midwest states that chemical companies are being forced into basic research in order to compete. The company that makes a breakthrough has a tremendous advantage that can contribute greatly to profits.

You don't agree?

This subject of creativity and industrial research is extremely controversial. There cannot help but be disagreement. Since it is such a vital issue, CHEMICAL PROCESSING cannot dodge its responsibility of throwing it open to analysis and discussion in its editorial columns. Naturally, your considered viewpoints will be welcomed by the editors throughout this series of articles on "Creativity & Survival."

Build the Organization Around the Man

In the offices of Deutsch & Shea, creativity specialists in

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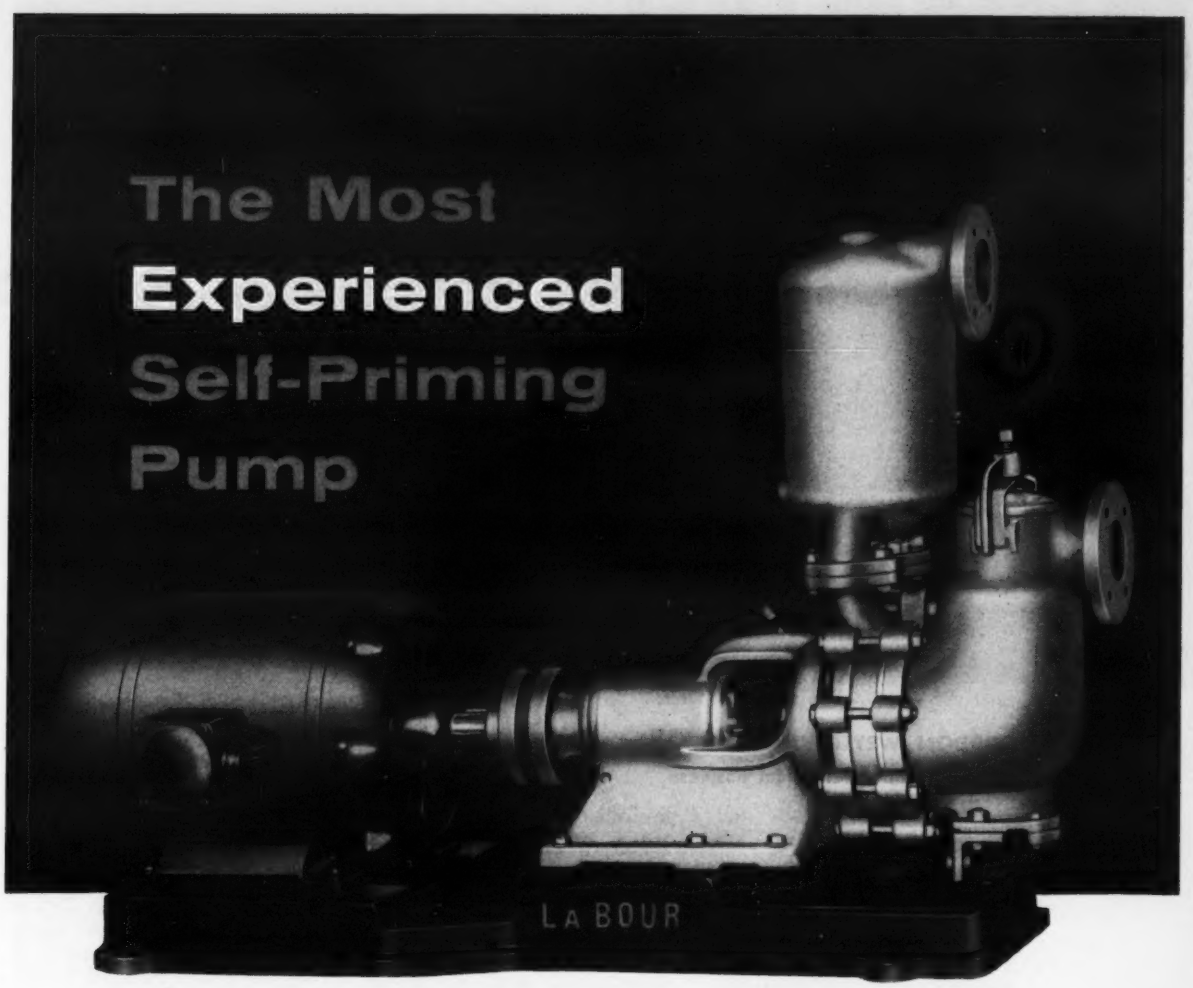

LaBour Type DPL as pictured here is the modern, improved counterpart of the first self-priming pump ever offered to the chemical industry. Nearly 40 years of experience in hundreds of plants all over the world have proved the reliability and efficiency of this unit to the satisfaction of a whole generation of engineers and operating men.

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CHEMICAL BUSINESS

Although it is a controversial topic, with investment bankers saying that it is too costly a method of financing —

Equipment leasing jumps 100% in CPI since '58

Major reasons for rapid growth are:

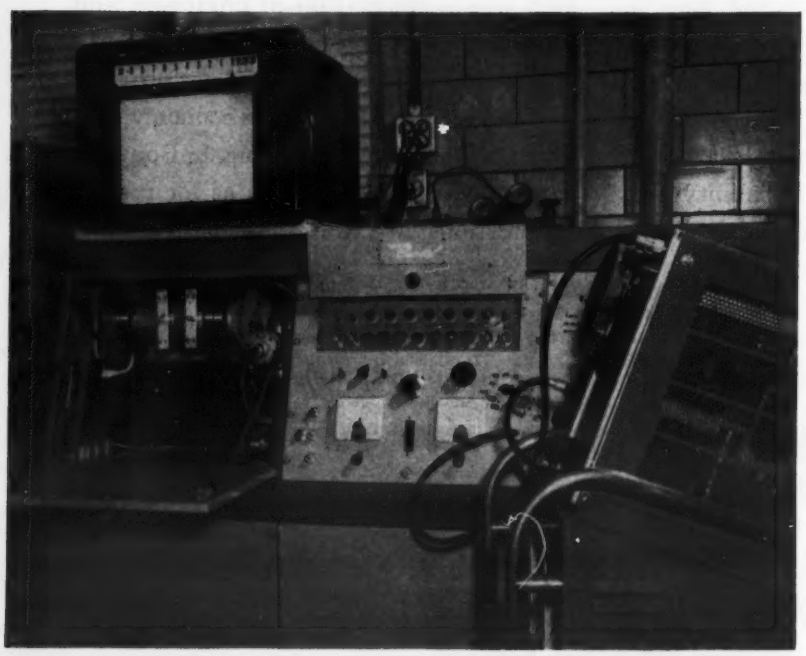
- **Releases working capital**
- **Increases profits**
- **Speeds automation**
- **Permits faster writeoff of equipment**

GORDON WEYERMULLER,
Associate Editor, Chemical Business

Computers, compressors, conveyors, lift trucks, automatic sprinklers, air conditioning systems, instruments, injection-molding presses, and a wide variety of other equipment are increasingly being acquired through a lease rather than through purchase by companies engaged in manufacturing industrial chemicals, drugs, petroleum products, rubber, paper, paint, plastics and ceramics. During 1960 about $150 million of production equipment will be leased to American industry, including the CPI.

In 1959 about $100 million worth of industrial equipment was leased. Hence, 1960 will show about a 50% increase, based on figures for first six months. Leasing in the CPI is increasing at about the same rate as for all of industry. It has more than doubled in annual volume since 1958.

All of the foregoing figures are strictly for leasing of industrial equipment. Cars, trucks, real estate, buildings, and railroad rolling stock are not included. Figures represent leasing done by professional leasing companies.



Since leasing a spectrophotometer similar to this one and other equipment worth a total of $30,000 in early 1960, a New Jersey chemical company has leased $300,000 worth of additional equipment. Hence, total on lease is 11 times that of only six months ago

Large and Small Companies Benefit From Leasing

Although many small and medium-sized companies use leasing to free available working capital for more profitable uses, large companies also lease for various reasons.

One of the largest petroleum companies in the world recently leased a $300,000 analog computer through a professional leasing organization for use in a refinery near Houston, Texas. Computer will be used to analyze pilot plant operations, speeding up transition to commercial plant.

This company has huge amounts of capital but felt this particular expenditure was best handled by a lease. Because a company is large does not mean it doesn't have a problem in justifying and acquiring a particular piece of equipment quickly. An equipment lease can be arranged in one week.

A small chemical company in New Jersey obtained its first lease in early 1960. About $30,000 worth of equipment, including a $15,000 spectrophotometer, was leased at that time. Since then, this company has leased $300,000 worth of other equipment so that total now on lease is 11 times that of only six months ago.

Another chemical company making solid fuels needed air conditioning equipment for an office housing a considerable number of engineers. Company could not well spare the capital to buy the air conditioning system, which would cost about $35,000. Hence, the equipment was leased.

A major oil company leased

two steam boilers which would have cost $250,000 each. Another company leased everything in an entire plant that would have cost about $3 million. Lift trucks and other material handling equipment are frequently leased since such equipment is fairly standard and is usually suitable for use in another plant.

About any kind of equipment can be leased with possible exception of that which is extremely specialized and could not be used in another plant. Even this can be leased, providing it is part of a contract in which other equipment is included or if a special contract is drawn to decrease risk to lessor.

A company desiring to lease equipment can just about write its own terms. Although usual leasing period is three to five years, it can vary from one up to ten years or longer. Usual term is 75% of the expected life of the equipment. Payments can be made monthly, quarterly, semi-annually or annually in equal, staggered or declining amounts. Minimum lease for industrial chemical equipment is $5000.

Leasing Serves As Sales Tool

Many companies manufacturing equipment or chemicals use leasing as a sales tool. For example, Du Pont has an arrangement with one of the large leasing companies enabling their customers to lease pneumatic handling equipment for polyethylene resin.

If a customer has a pneumatic conveyor, Du Pont can sell him resin in bulk, shipped in hopper-bottom cars. Since resin can be supplied at a lower price in bulk and customer saves considerable labor, his business is more profitable and he is likely to become a better customer for Du Pont.

If customer cannot spare the capital for the pneumatic conveyor, Du Pont suggests he consider leasing it from the professional leasing company and provides information on how this can be done.

Perkin-Elmer recently set up a leasing plan for its instruments, utilizing the services of a leasing company. Minneapolis-Honeywell also has a plan to lease instruments. Among other companies using leasing as a sales tool are Cleaver-Brooks, Carrier Corporation, Vilter Manufacturing Company, York Corporation, and many others. Practically every manufacturing company of fork-lift trucks has an arrangement for leasing his equipment.

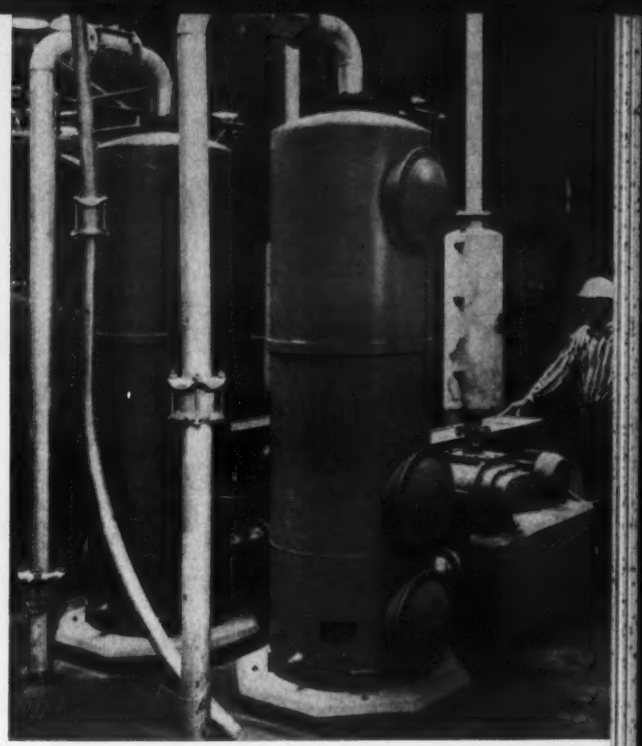
Leasing Frees Capital For More Profitable Uses

Most important reason for leasing equipment is to free working capital for more advantageous use in business. For example, the missile-fuel manufacturer mentioned earlier calculated that if he had purchased the $35,000 worth of air conditioning equipment, this would have meant a sacrifice of $17,500 in before-tax profits in first year alone. Hence, it was more economical to lease the air conditioning equipment and preserve working capital.

Also, a company with a high degree of liquidity provided by large working capital and a small investment in fixed assets has the definite advantage of great flexibility.

In the case of the oil company that needed the two package boilers, the annual savings to be effected by installation of the units was shown to be $100,000. Annual rental for the two units was $70,000. On the basis of a 50% pretax earnings, they could not justify acquisition of the units. On the basis of substitution of a cost of $70,000 a year for a cost of $100,000, they could justify the installation.

One of factors most responsible for leasing boom is automation. For example, it has been estimated that at present about 75% of new equipment goes for modernization and only 25% for new plants or expansion. A well-known economist recently stated that $100 billion worth of American industrial equipment is obsolete.



Portion of pneumatic conveyor system for polyethylene in a plant. Du Pont has an arrangement enabling their customers to lease similar equipment for handling polyethylene. With the customer having a pneumatic system, Du Pont can ship him resin in bulk in hopper-bottom cars. This saves the customer money and makes it likely he will be a better customer for Du Pont

Companies are finding that they must automate and modernize their plants to compete. Where is the capital to come from to modernize plants? Where needed capital is not readily available from other sources, leasing permits equipment to be acquired immediately and costs to be cut through its use.

Also, the cost of leasing can be charged as an operating expense for the usual term of three or five years instead of the conventional period of ten years or longer for writing off equipment purchased. This postpones taxes to a period when they can be more easily paid out of increased profits.

Will Income Tax Changes Eliminate Leasing?

Some people are saying that leasing is a tax gimmick that will fade out as soon as the Internal Revenue Service catches up with the leasing companies. It is interesting to note that this same prediction was made in 1954 when the Excess Profits Tax was repealed and faster depreciation schedules were allowed. Leasing companies didn't really start to boom until after 1954. A study conducted by the Foundation for Management Research predicts a large increase in equipment leasing dollar volume in the years ahead.

It is certainly possible that changes in the law or interpretation of it may affect leasing adversely but it is still likely that equipment leasing will continue to grow rapidly. Actually, the tax advantage is not the main benefit of leasing. Leasing would still be attractive to many companies even if they were forced to use normal depreciation schedules for equipment leased.

The U. S. Government itself recently embarked on an extensive leasing program in having postoffices built by private interests and then leasing them back. Of course, for the Internal Revenue Service to treat a lease contract as such, it must be a true lease and not a conditional sales contract. Leasing can be charged as an operat-

Feeds 1-ton-per-minute bagging machine from stockpiles up to 50 feet distant, also unloads box cars at 100 tons per hour with 15 feet haul to elevator.

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"H-25 . . . Most efficient mover we ever used" says Plant Superintendent

"The H-25 is easier to operate; has shorter turning radius and gives nearly twice as much output as our older tractor-shovels," says James C. Harnage, Plant Superintendent of Berrien Products Co., Nashville, Georgia. "It also spills less, keeps the floor cleaner, and maintains better working safety conditions. Digging traction is good and the lift is fast. It's proving to be the most efficient mover we ever used and is even outperforming larger movers".

Feeding 5-10-15 fertilizer from the stockpile on a 50 ft. haul, this H-25 is able to keep up with the full 1-ton-per-minute capacity of the bagging machine. The power-steer and power-shift transmission of the H-25 gives such ease of operation that an operator can maintain a fast, high-production pace the full shift without strain.

Whether your bulk-handling needs require the Model H-25 with 2,500 lb. operating capacity, or a larger tractor-shovel up to 12,000 lb. operating capacity — you'll find a "PAYLOADER" is the standard of *any* comparison. Your Hough Distributor is ready to prove it, and has the finest service and parts facilities in the business, backed by Hough factory service personnel.

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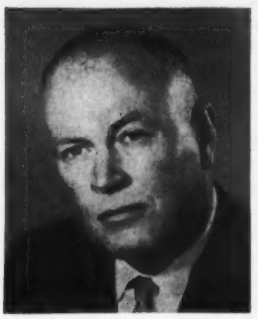
ing expense in a government contract.

Is Leasing Too Costly?

Some say that leasing is too expensive a method of financing. This viewpoint was expressed by an investment banker, Donald R. Gant in a widely quoted article, "Illusion in Lease Financing," which appeared in the Harvard Business Review in April 1959.

Let's examine the cost of leasing. A typical lease for five years would cost lessee about 125% of the original price of equipment. Cost would vary according to rating of company and amount of money represented by lease.



D. P. BOOTHE JR., equipment leasing pioneer and probably the foremost authority in the field. He was the first president of U. S. Leasing, 1952-54, before assuming his present position as president of Boothe Leasing

After lease term was up, the lessee could lease the equipment for another period at a greatly reduced rate. Other alternatives would be to have lessor take over equipment or to purchase it for 10-15% of original cost. Exercising the option to buy usually would not be wise from a tax standpoint. Leasing for another period is choice most of time.

If a company has an excess of working capital, leasing would probably not be the most economical method of financing the cost of new equipment. However, such a company might still want to

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Problems Ahead For Oil Industry As It Moves Into Plastics

It's a 'prescription business' demanding sound marketing strategy, strong technical service and creative research in supplying hundreds of product variations for a multitude of application needs

By JOHN MELLECKER

The oil industry seems to be heading towards upgrading its petrochemicals into products much nearer the consumer's pocketbook.

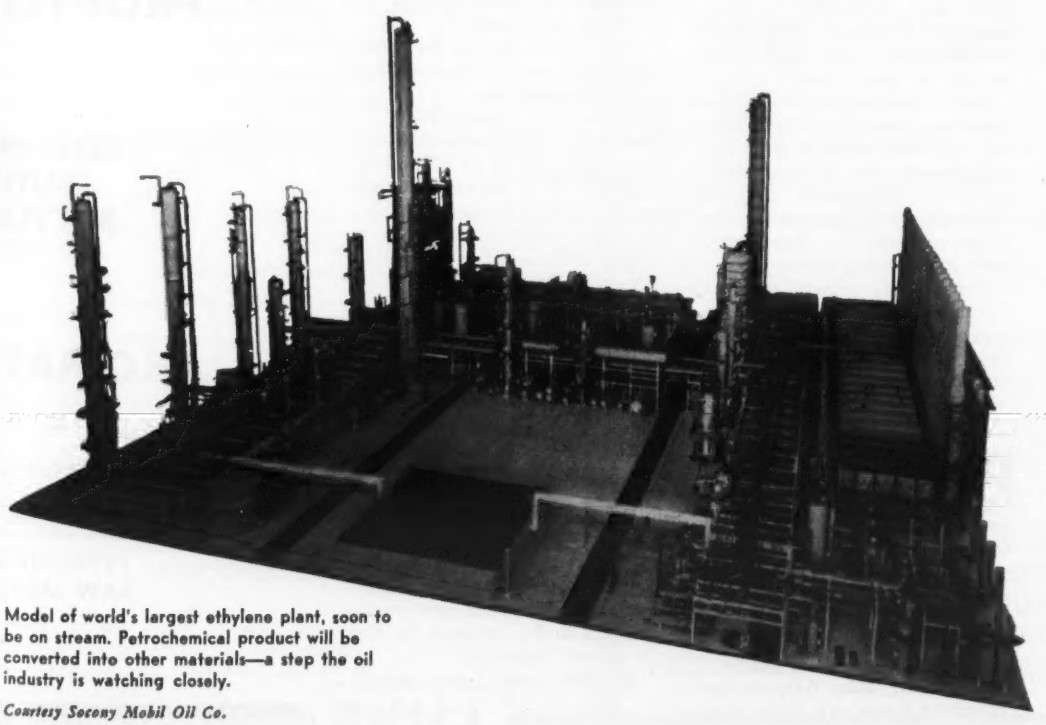
With oil ever long on barrelage and short on profit, industry leaders are showing increasing interest in plastics as a source of higher profits.

Why plastics? Of possible diversifications (with petrochemicals as a starting point) plastics currently appear to offer almost unbounded opportunity. Their horizon is difficult to define. Optimism is the controlling attitude.

Two examples weighing heavily on this situation are, first, the recent passing of the billion-lb mark by polyethylene, and second, the lure of such lightly penetrated markets as building construction.

Present pattern of petrochemicals conversion into plastics is shown by diagram on page 30. At extreme left are the most basic petroleum raw materials. Towards the right are the petrochemicals, the simpler plastics, the more complex plastics, and finally, those plastics whose manufacture and marketing have required development of special skills.

Most plastics are today produced by the chemical industry, which is a major consumer of petrochemicals produced by the oil industry.



Model of world's largest ethylene plant, soon to be on stream. Petrochemical product will be converted into other materials—a step the oil industry is watching closely.

Courtesy Socony Mobil Oil Co.

Strong Reasons for Entry

It is quite evident that some justification of oil companies' moves into polyethylene, polypropylene and polystyrene lies in the fact that the technology involved is merely an extrapolation of skills developed in producing petrochemicals.

Huge markets for polyethylene and polystyrene, combined with an almost certain bigtime future for polypropylene, make tonnage production seem like an obvious next step.

Who better than the oil companies — as big-volume converters of petroleum materials — can take this next step?

There seems little doubt but that if the oil industry wants to it most certainly will further enter the plastics picture. But will it be on a tonnage basis—which would mean major changes for the plastic industry — or on a basis more akin to the industry's present structure?

On the positive side of oil's entry into plastics are such factors as both oil and plastics-producing chemical companies being large corporations with large amounts of capital for investment and multi-billion-dollar sales potential.

Of no minor consequence is

Problems Ahead for Oil Industry

From preceding page

the fact that the oil industry controls the petroleum raw materials for making plastics.

Perhaps not always an asset is the oil industry's pattern of planning 10 to 20 years ahead. This factor may come in handy, however, if the industry finds it necessary to wait a longer time than anticipated for plastics profits.

Jersey Standard years ago began studies that led to a decision in early 1957 to go into polypropylene. Now, more than $30 million and three years later, production and marketing operations have only begun.

But Problems Loom

That there are serious problems ahead for the oil industry as it enters into plastics *type* manufacturing and marketing has been recently emphasized by other writers.

Harvard-economist Levitt, in "Harvard Business Review" (*1*), characterizes the oil industry as one which has consistently overlooked opportunities to expand its primary market over the years. Contentedness in the role of big-volume supplier to a market with built-in demand has resulted in attentiveness to the needs of customers.

Such is not easily corrected, says Levitt. Customers are produced only when the entire corporation is a "customer-creating and customer-satisfying organism" — something Levitt obviously feels the oil industry is not.

With specific attention to the plastics problem, management-consultant Talley, in a recent article (*2*), charges petrochemical companies as being too much under the influence of petroleum thinking. Oil-company boards of directors, he believes, are handicapped by lack of knowledge of the chemical industry. The companies lack operating management at all levels — manufacturing, marketing, research — geared to the quite different problems of rapid product obsolesence and the necessity for prompt decisions characteristic of the chemical industry.

"These are problems . . . but they can be met," comments newly-formed Mobil Chemical Company president Paul V. Keyser. "Petroleum companies are beginning to recognize the need to set up entirely separate organizations on a fully integrated basis to deal with their chemical problems. They are seeking assistance of a consulting and operating nature from people of long experience in the chemical industry . . ."

Some, on the other hand, feel the oil companies — as others in the past — may vastly oversimplify the problems certain to be encountered in the making and marketing of materials as deceptively alluring — but as volatile — as plastics.

The most likely factor to be overlooked, rationalized or underestimated is the basic nature of the plastics business — which is in many ways diametrically opposed to the traditional pattern of oil-company operation.

Prescription Business

Plastics . . . industry veterans say . . . is a prescription business. There are standard products — many — but from them are produced myriad variants. Products are made to specification, but more often bought on performance.

Each end-application requires a grade of material that will not only meet service requirements but permit fabrication in machinery ranging from the most modern to the most obsolete — frequently both in the same plant.

Remarkable growth in *number of product variants* for one polyethylene manufacturer is shown by accompanying table (page 33). Data applies only to *film-grade* polyethylene. In February 1959, nine basic grades were employed, from which variants for individual customer needs were produced. By July 1960 — less than a year-and-a-half later —the list had grown to 23!

The most striking point is, however, that the theoretically-possible number of variants tallies to a whopping 1260!

All told, this five-plastics producer turns out more than 4000 products to maintain its industry position. Few individuals in this company possess — or for that matter have any use for — the complete plastics product price list.

Polymerization Hard to Control

Filling the multitude of specific needs for customers isn't the only problem of the plastics producer.

Control over plastics product quality is in a world by itself — completely foreign, plastics production people say, to petrochemicals kind of processing.

Polymerization is very complex, very sensitive to control. In petrochemical synthesis, one generally gets the chemical he is after — high yield or low. In polymerization, a polymer is generally produced, but it's all too easy to get one that's not wanted.

There are no specifications comparable to those of ordinary organic chemicals, to which polymers can be produced. Instead, the polymer — after being produced — is tested according to standard, empirical tests, and its specifications are determined. Performance is determined in standard equipment.

Petrochemicals, on the other hand, are made to and sold by rigid specifications.

In actual production, a plant-run of a petrochemical may turn out to be off-specification. It is often a rather simple matter, however, to re-run the material through a still or dispose of it by blending with other stock.

What happens in the case of polymers?

Industry people say that seven out of ten batches may turn out to be perfect as intended for customer requirements. The other three may be un-usable — by that customer.

Polymers can't be re-run "through the still." The best disposal of an "off" batch is to find a customer with a different need — which just might happen to be satisfied by the "problem" material.

In the past, near-misses,

To page 34

SEPARABLE PRODUCTS OF INITIALLY IMPRECISE COMPOSITION

METHANE

ETHYLENE

PROPYLENE

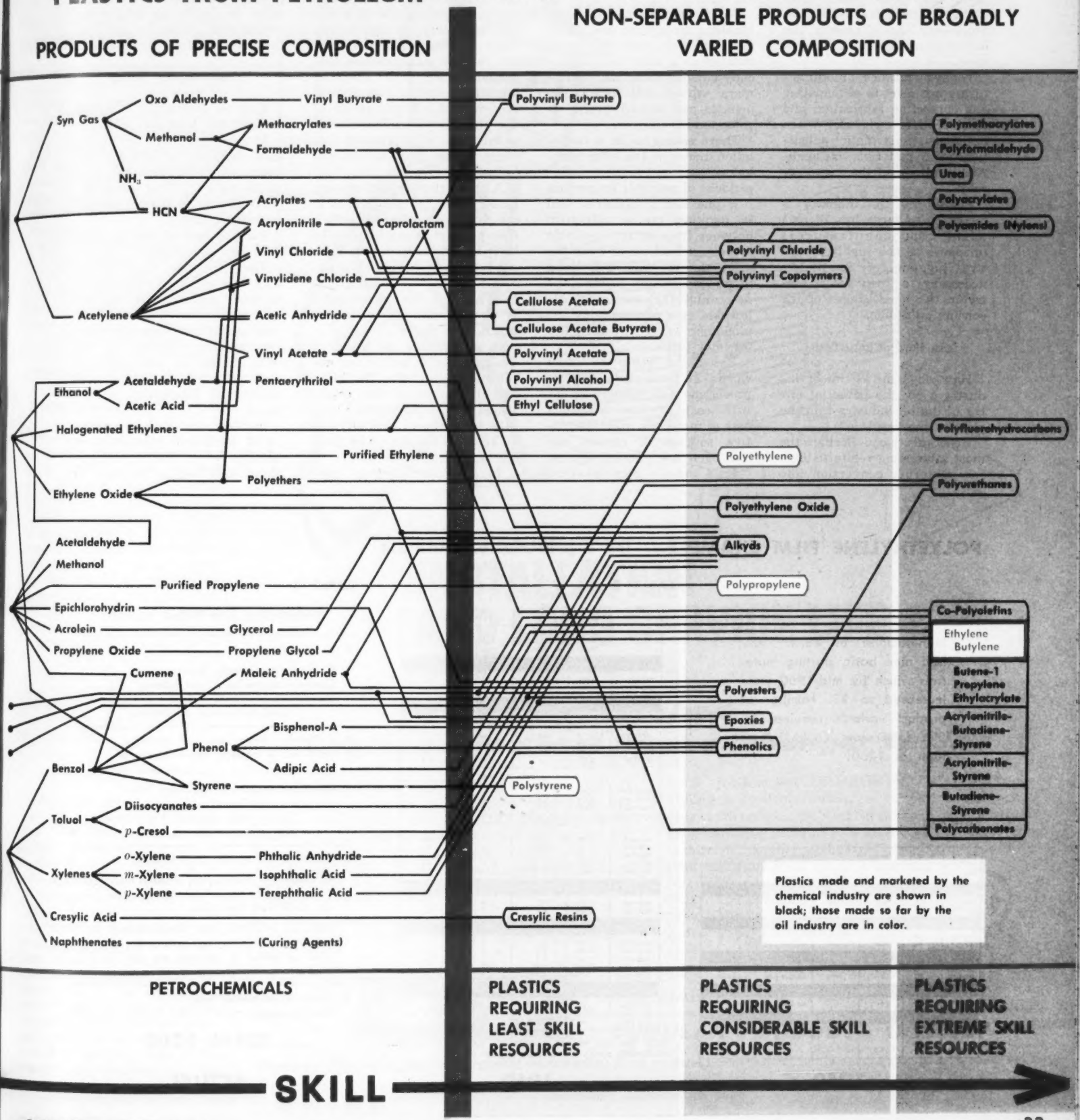
BUTADIENE
BUTENES
BUTYLENES

AROMATICS

PETROCHEMICAL RAW MATERIALS

PLASTICS FROM PETROLEUM

The farther right on chart, the more skill required for profitable operation



Problems Ahead for Oil Industry *From page 32*

often due to too much faith in control over polymerization processing, have caused the industry no small embarassment.

Today, plastics manufacturers are alert to anticipating and correcting fabrication and service difficulties. When necessary, systematic substitution of materials is made. Above all, keep the customer sold!

Feared by the industry is incursion of large lots of materials from manufacturers unaware of the highly sensitive juggling of small lots necessary to keep the industry in the good graces of the consuming public.

Look Hard at Basic Costs

How does the chemical industry view the potential entry of the oil industry into the plastics marketplace?

Reactions vary. Perhaps the most interesting relate to basic raw materials conversion into monomers.

It is one thing to have ethylene, propylene and other raw materials, and still quite another to be able to economically convert these into monomers which will bring the pennies-per-pound profit on compounded polymer.

There seems to be a correlation between the total market volume and price — independent of polymer properties.

If one has a monomer and is banking on a million-ib polymer from it, it is possible to project backwards from the price the polymer will bring in an equilibrium market and determine the maximum allowable cost of producing the monomer which will allow polymer profit.

Better be sure, in other words, of *basic* costs. Cost of processing raw materials, future cost of raw materials, cost of materials from alternative sources of carbon and hydrogen are elementary.

It is today's good business, say plastics men, to polymerize propylene that is available virtually as byproduct. What happens when the market reaches such volume that propylene has to be made as a primary product may change the market attractiveness of the polypropylene, however. It is this kind of estimation that plans should be based on, say industry veterans.

A pet rationalization, say plastics men, of newcomers to the field is that, armed with a new product, a market can be built by knocking out an older product with "inferior" properties . . . in part or completely. This, say the experienced, is the hardest thing in the business to do.

It is possible to knock a given material out of an application. But the flexibility and resources of the established manufacturer have usually in the past enabled him to keep his volume up by finding other applications.

In planning future new product volume, its much safer to figure on adding to rather than displacing some of the total industry production.

Rubber Industry Lesson

The oil industry isn't first to take the leap into plastics.

The rubber industry made this decision a number of years ago. The reasoning . . . at the time . . . had many aspects similar to that of the oil industry today.

Plastics looked like a good field for high profits.

The industry was accustomed to working with "plastic-like" materials. It had familiarity with "tailoring." It was used to meeting customer requirements having to do with contour of part, speed of molding, and size, type and variety of fabrication equipment.

Rubber industry management went into plastics as if plastics were rubber. Everything first had to be tried to

POLYETHYLENE FILM EXAMPLE—"It's a prescription business"

Manufacturer in early 1959 had nine basic starting materials which by mid-1960 were increased to 23. Number of product variants required by film fabricators could be as high as 1260!

TABLE 1

PRODUCT	Typical Material Properties		Typical Film Properties (1.5 mil)				
	Density	Melt Index	Coefficient of Friction	Blocking Resistance	Gloss	Haze	See-Through
GENERAL PURPOSE							
DYNH-3	.917	1.7-2.4	0.42	Good	45	20	1
DFD-4200	.918	1.7-2.4	0.20	Good	80	11	10
HIGH CLARITY							
DFD-0118	.920	1.7-2.4	0.18	Good	105	9	25
DFD-0114	.920	1.7-2.4	0.27	Very Good	95	10	23
GENERAL USE							
DFD-0111	.923	1.7-2.6	0.27	Good	132	6	45
DFD-0118	.923	1.7-2.6	0.12	Very Good	132	6	44
HIGH CLARITY, HIGH IMPACT							
DFD-0150	.922	5-8	0.10	Very Good	130	7	42
SPECIALTY APPLICATIONS							
DFD-0924 Black 865	.910 (for base resin)	1.7-2.8	0.27	---	---	---	---
DXD-0964	---	2.0-4.0	---	---	---	---	---

1959

TABLE 2

PRODUCT	Typical Material Properties		Typical Film Properties (1.5 mil) Opticals		Impact
	Density	Melt Index	Haze	Gloss	
GENERAL PURPOSE					
DYNH-3	0.918	2.0	20	45	6.0
DFD-4200	0.918	2.0	12	80	6.0
GENERAL CONSUMER PACKAGING					
1. High Clarity					
DFD-0100	0.922	2.0	5	130	4.5
DFD-0111	0.923	2.0	6	125	5.0
DFD-0118	0.923	2.0	6	125	5.0
DFD-0137	0.923	2.0	8	125	5.0
2. Very High Clarity, High Impact					
DFDA-0350	0.923	1.2	5	140	6.0
DFDD-0354	0.924	1.2	6	135	5.5
DFDD-0358	0.924	1.2	6	135	5.5
3. Very High Impact, High Clarity					
DFD-0600	0.922	0.75	7	120	8.0
DFD-0601	0.922	0.75	7	120	8.0
DFD-0602	0.922	0.75	7	120	8.0
DFD-0604	0.922	0.75	7	120	8.0
DFD-0606	0.922	0.75	7	120	8.0
GENERAL USE					
DFD-0150	0.924	7.0	6	125	3.5
DFD-0152	0.924	4.0	6	125	4.0
CONVERSIONS					
DHD-6150	0.930	4.5	4	160	1.5
DHD-6151	0.930	4.5	4	160	1.5
DHD-6152	0.930	4.5	4	160	1.5
DGD-4002	0.950	3.5	22	60	1.0
DGD-4552	0.950	6.5	6	130	1.0
SPECIALTY APPLICATIONS					
DFD-0924 Black 865	0.918	2.0	---	---	5.0
DXD-0964	---	2.0-4.0	---	---	---

Table does not indicate modifications such as antioxidants, antiblocking agents and different degrees of slip.

1960

TABLE 3

Polyethylene Film Product Variants

1	Basic resins	
	Common approximate density needs	7
	Common approximate melt indexes	3
	Common approximate optical levels	3
	Total basic resin possibilities	63
2	Customer basic process variations (chill roll & mandrel, blown tubular & water bath)	2
	Customer equipment variations (older extruders, older treaters)	2
	Total basic process & equipment variations	4
3	End user & converter requirements	
	Approximate degree slip & anti-block: (none, slip but no anti-block, low, medium, high, very high slip)	5
	(Special additives, anti stress-cracking, ultra-violet inhibitor, colors, etc., are almost unlimited in number, are not included)	
4	Practical estimated total film compound variants (63 x 4 x 5)	1260

TOTAL 1260

ACTUAL

see if it couldn't be worked and marketed like rubber.

Conventional rubber-milling equipment couldn't handle vinyls. It was not built for the pressures or temperatures required by this material. Eventually Banbury mixers equipped with cooling jackets had steam in these jackets for heating. Gradually, equipment suited to the physical properties of the new materials was acquired.

What had looked like a field for quick return has turned out to be anything but that.

Rubber-company plastics operations which have been most successful have patterned themselves along lines similar to chemical-company plastics operations.

Chlorine Industry Another Lesson

Another industry has likewise had its flirtation with quick profits from plastics, only to come down to earth. This is the chlorine industry.

Chlorine producers turn out large volumes of low-margin product to rigid specification, and which is bought on specification. Polyvinyl chloride appeared to be a "natural" outlet for chlorine — in a highly profitable form.

Unfortunately, sales problems and costs have taken much of the bloom off of original expectations, and much of the profit.

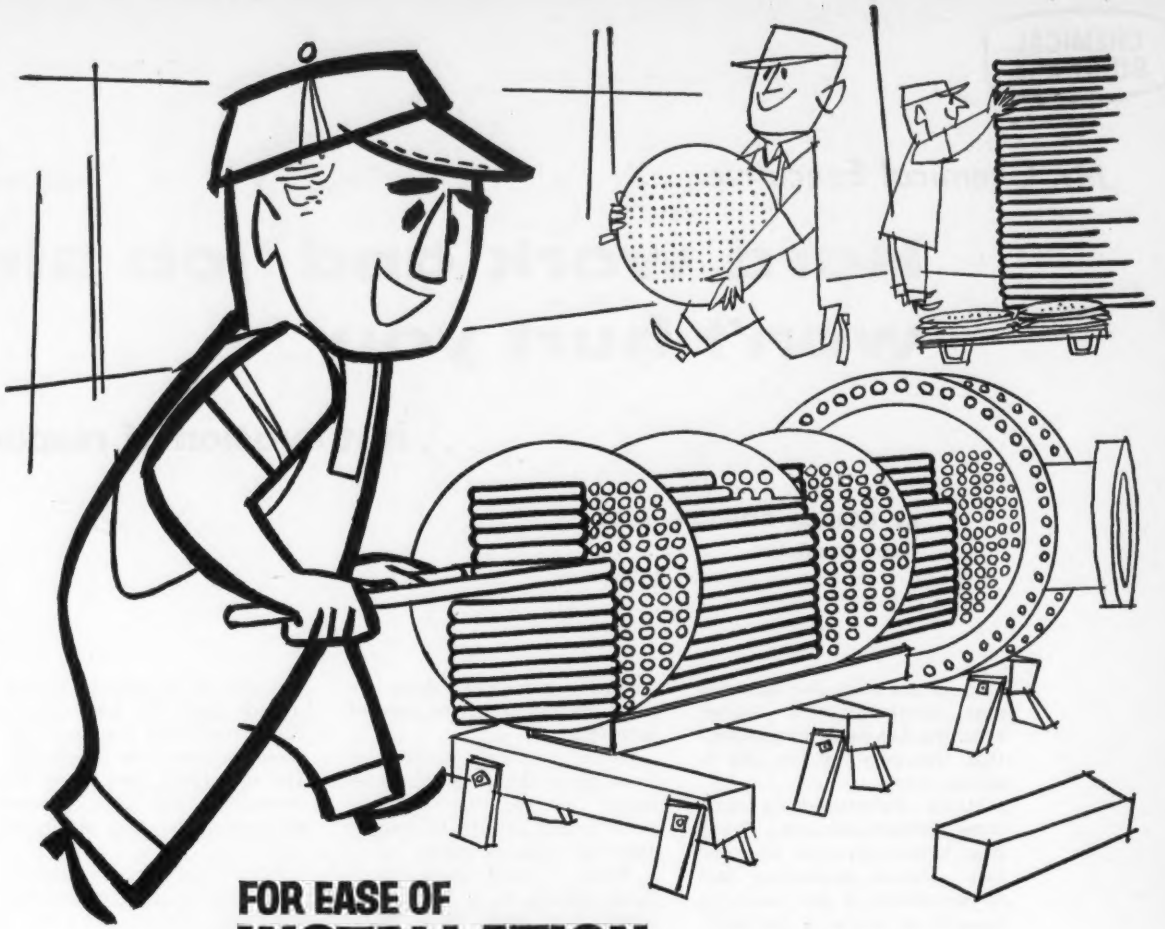
For PVC, too, is a prescription business.

Tech Service A Must

Most essential element to successful marketing of plastics is technical service. Required is not only a staff of technical sharpshooters, but also a laboratory staffed with backstopping specialists.

Du Pont — certainly no newcomer to the field of putting across its chemical products (including polymers) into practical, successful consumer application — has spent more than $10 million for a technical service laboratory at Chestnut Run, near Wilmington, Del. Now serving eight of the company's departments, the

To page 84



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Check 4897 opposite last page.

Mr. Chemical Executive . . .

Hard work and 'job stress' won't hurt you

. . . but evasion of responsibilities will

By GERALD GORDON, M.D.
Chief Psychiatrist
E. I. du Pont de Nemours & Co., Inc.

In recent years the business man, particularly in higher echelons, has been admonished that the pace of his life is killing him.

He is threatened by such scare statements as "your next promotion may be your last." Others encourage him to be proud of his ulcer, to wear it as sort of a businessman's "purple heart," as though it were a sign of virtue, of devotion to a cause beyond the call of duty. Gratuitous advice tells him to slow down, take it easy, take longer vacations, don't work too hard.

Many businessmen are frightened by such advice, and find themselves in a trap.

Most successful men achieved their positions by virtue of hard work and aggressiveness. They have almost boundless energy to expend and have found great satisfaction in the struggle.

Yet, the executive of today is more than ever beset by social and economic pressures which seem to degrade successful accomplishment. What is he to do? Give up?

It is true that stress diseases have become today's killers. But are executives particularly prone to them? Studies in our company comparing the occurrence of stress diseases in the executive group with the occurrence of the same disease entities in the general company population show almost exactly the same rate of incidence.

Other medical authorities have made similar studies and found that the executive has no different pattern of disease than the general public.

When a noted figure has a heart attack, it is front-page news, but aside from associates, little is known of hundreds of other victims who are stricken on the same day.

Where the Stress?

Where, then, does killing stress come from? The normal individual working under conditions found in modern industry for 8 or even 10 hours a day, particularly the executive, can hardly be said to be exposed to stresses incompatible with biological existence.

Spending $20,000 is no more difficult a decision for the executive than is spending $20 by the janitor. By the time he becomes an experienced executive the businessman should have learned to function efficiently even with the pressures of the job.

Here is how such adaptation normally takes place: When first exposed to any stress, the body becomes alarmed and over-reacts in a general way. If resumed the next day the work may be a little easier. Unnecessary side reactions of a general nature subside and the body disciplines itself into a state of efficient comfortable adaptation. The individual then meets his stress with less effort, greater efficiency, and less strain on the body.

Our experience indicates there is very little inherent in the work situation, as such, to cause emotional (stressful) difficulties.

What, then, is wrong with the way some businessmen go about their adaptation, that makes them react with stress to situations that others meet with calm?

It is in the pattern of *improper mechanisms* for dealing with daily situations, brought to the work place by the sufferer, that we find the culprit.

Evasion, Not Collision

Usually these are techniques of avoiding unpleasantness, developed in earliest childhood for dealing with stressful situations.

An executive — or any individual — with a high degree of mental health will automatically seek and use effective mechanisms; conversely, most people, having poorer mental health, suppress those mechanisms.

It is our emotions, by the pressures and tensions they create, that try to tell us to

DR. GORDON is chief of the psychiatric section of Du Pont's Medical Division; has been a psychiatrist on the company's medical staff since 1946.

He received his medical degree in 1938 through studies at the Universities of Alabama and Louisville. Internship was in California Hospital of Los Angeles.

During the war, Dr. Gordon had extensive psychiatric practice with the U.S. Army psychiatric hospitals in England. He had a private psychiatric practice in Wilmington for one year after the war, before joining the Du Pont medical staff.

Dr. Gordon is a member of the AMA, the American Psychiatric Assn. and the American Academy of Occupational Medicine, and is certified in occupational medicine by the American Board of Preventive Medicine.

"Modern man seems to have forgotten that life is basically a conflict"

look into our lives, see what's wrong, and fix it up. Yet most men consider emotions a ridiculous form of weakness worthy only of scorn . . . enemies to be conquered at all cost.

Somehow, we must accept the fact that for every event in our lives there is an accompanying flow of emotion to organize the body to meet our problems correctly.

Yet, over and over, my patients tell me that they have no *real* problems — that the petty irritations in their lives are too trivial to be upset about. They seem not to realize that if we fail to meet each little problem effectively there is soon quite a collection of unsolved problems.

On being repressed, all the little increments of emotional energy accompanying each event accumulate to a considerable feeling of tension, for the danger becomes more serious in the aggregate.

Nature created man with an automatic fire department but which man in his infinite wisdom has reorganized into ineffectiveness.

When tension rises high enough, it may begin to seek other outlets through perfectly innocent organs—stomach, heart, blood vessels. This is where stress disease comes into the picture.

Condensed from a talk before the 41st Annual Conference, National Office Management Association, Montreal, Canada

Enter Stress Disease

Here, clearly, is nature's second line of warning: Since we don't accept the warning of our emotions, she tries hurting us physically with pain.

At this point the individual's family, friends, boss, and often his personal physician have one prescription for treatment. This panacea consists of removing him from all unpleasant situations and insisting that he leave work, calm down, and rest.

I have followed many cases in which people have been removed from more and more of their responsibilities until they become totally incapacitated and non-productive. Such problems cannot be solved by refusing to be aware of them, or by evading our responsibilities for their solution.

What to Do

How, then, does one recognize dangerous emotional tension and deal with it before it builds up to stress disease?

If an individual finds things do not work out well for him, he must look within himself for redress — it is rare to find a solution in his external environment.

Doing such, however, is a painful process — and so is usually avoided as long as our explanations and excuses for blaming something or someone else are acceptable.

When life becomes difficult, it is reasonable to want to get away. But the self-disciplined individual, knowing problems are not solved that way, has the courage to see the struggle through to a resolution.

An individual who habitually evades his responsibilities will repeatedly follow his usual pattern, but usually maneuvers the circumstances so that someone else has to protect him.

I can assure you that it is not always kindness to encourage this evasion by acting upon the individual's own prescription. It is usually kinder in the long run to handle the situation in such a way that he develops courageous patterns of behaviour through solving his own problems with the accompanying greater security.

Supervisor Plays Key Role

Now, where does the supervisor of the person running into difficulties come into the picture?

Certainly, the supervisor cannot accept the subordinate's excuses for his failure. The superior has a serious obligation to examine all circumstances surrounding the subordinate's shortcomings.

Where circumstances indicate that the error lies in the individual's failure to adapt to the realities of his situation, the supervisor must in all fairness to the man, the organization, and himself exercise his authority to the end that the failing subordinate meets his responsibilities with effective personal action.

The supervisor who evades his responsibility for informing subordinates directly, accurately, and in a straightforward manner of the facts regarding their performance, in turn creates unresolved tensions and stresses in himself, for his success is dependent upon their performance.

One of the most common complaints I hear from employees is that they are not clearly informed regarding their job performance. The common excuse for such failure to meet this basic supervisor responsibility is that the supervisor believes he does not like to hurt others, or that it is wrong to upset people.

Life Is Not All Sweetness and Light

What he fails to recognize is that there is no way for anyone to evade his responsibilities for very long.

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CHEMICAL BUSINESS

After five years of shake-down in the chemical industry, computers have become workhorses for some, sources of disappointment and disillusionment for others. This article — based on experiences of the process and design engineering section of a chemical company — re-assesses both the limitations and uses of analog and digital computers, and advises one to . . .

Keep your sights on the *ultimate* job process computers will do

by **ROBERT E. GREENHALGH**
Dow Corning Corporation, Midland, Michigan

Computers — both analog and digital — have had a spectacular history in the process industries during the past five years. In this brief span computers have been, successively, miraculous thinking machines, failures, limited successes, and — today — accepted producing tools.

What have we really found out about computers during these five years? What can, and can't, computers do? Let's look first at their limitations.

The most obvious limitation of a computer is its inability to think.

Then, too, even the fastest, biggest computers in the world are extremely limited in their capability to simulate any real physical process. Every new programmer quickly realizes that many assumptions are necessary to keep computer running times down to practical period-lengths.

Usually when a new man enters into the field of computer programming he mistakenly expects the machine to be capable of making very precise calculations. He thus proceeds to write in ten minutes equations that would take ten weeks to solve. So his first lesson is to make enough simplifying assumptions to cut the running time to ten minutes or ten seconds or whatever time is reasonable for his application.

Console (left) simulates a nuclear reactor and cutaway (right) represents a reactor core working at 100 kw. Together they make Mark One, a prototype of a reactor simulator for training operators, setting up reactor programs and supplementing lectures on kinetics (*British Information Services photo*)

Lack of Math Models for Process Dynamics Problems

A computer is not really easy to use, particularly on process dynamics problems. In fact, it is very difficult to do so. Good mathematical models are not available today, and they cost an appreciable amount in research time and money to develop. We have found that even the supposedly well-known fluid flow relationships for pressure drop through control valves are not adequate and must be researched to give acceptable mathematical models.

Finally, the mathematical models of a significant percentage of the physical problems encountered in chemical processing require use of partial differential equations which cannot, in general, be treated directly on an analog computer. There are means of solving these problems, but at the expense of either accuracy or circuit simplicity.

The digital computer can, in theory, handle any number of independent variables with any desired degree of accuracy. But, in practice, a problem with more than three independent variables has to be very important to justify the long and expensive computer running times required to solve it.

Advantages: Calculating Speed and Time-Scale Compression

Is the picture all black? What can computers do? The answer, of course, is *plenty!*

Much former routine work with either slide rule or desk calculator is eliminated. It means that fewer approximations and rule-of-thumb calculations are made. It means that designs are investigated more thoroughly; process calculations are made not

only at the design point but also at operating extremes.

Second, computers give engineers new understanding of complex processes which cannot otherwise be obtained.

For example, a real process may take six hours to level out after a control change, and thus an engineer only sees one new value in a full day's work. And he has probably had many intervening thoughts which have distracted him. Simulation of the process on an analog computer can compress the real time lag from six hours down to a few seconds or minutes, so that the investigator can see the results of many different operating conditions in quick succession.

An electronic analog of a process also can easily do other things which a real process almost never does, such as operating far from the design or product specification point. Yet sometimes important keys to understanding are marked out near the design point and are only revealed by operation at points greatly removed from the specification point. (This assumes that the correct mathematical model is known and has been set up on the computer. The wrong model can, of course, be equally misleading.)

Author Bob Greenhalgh heads computer activities for Dow Corning at Midland, Mich. With title of assistant manager of design engineering, he is in charge of two functional groups: Process Engineering and Chemical Project Engineering.

Bob received his BS in ChE from the University of Michigan in 1947, and MS in 1958. He is a registered professional engineer and is currently chairman of the Midland Section of the AIChE.

Here's Where Digitals and Analogs Apply

Digital equipment is probably doing most of the sizing of distillation equipment today, as well as of piping systems, and is undoubtedly doing a large share of the heat-exchanger and pressure-vessel calculations.

Analog computers are used for correlating reaction kinetics and thus giving reactor designers the information necessary to construct reactors which can tailor-make products having predetermined combinations of molecular species.

Another use of analog computers, now small but which will become important, is in process design. Any given design is recognized as a collection of arbitrary selections, and this frequently gives even the best process designers a slightly uneasy feeling.

A process designer will often, when looking at his final design of a process, ask himself such questions as, "I wonder what effect the size of that accumulator tank has on the dynamics of this unit." Or, "I wish I knew what the effect would be of relocating that product takeoff control valve ahead of the recycle line." In the past, he has never had the means to find out, but the analog computer has made finding out not only possible, but really practical — especially in processes which are not too complex.

To answer these process questions the process designer, *when he is building the analog circuit,* simply sets the accumulator tank cross-sectional area (or volume, depending on his model) on a calibrated potentiometer to answer the first question, and inserts a switch in his circuit to answer the second question about the location of the control valve. In a similar way he can design all parts of the analog circuit so as to make it easy to investigate the variables in which he is interested.

Once the circuit is installed on the computer, a few hours of "playing" with the tank sizes, control loops, heat exchanger areas, and reactor holdups will result in a process in which the designer can have considerable confidence. This same model can be used to train the plant operators prior to startup.

Communication Barrier Between Engineer and Computer

I have implied in the above that the same man designs the analog circuit, the control loops, and the process itself. This is intentional, because I believe that only when this is the case will the ultimate be achieved. The problem of communication between man and computer is far from solved, and can be so great as to render the computer a hindrance rather than an aid. Under these circumstances, inserting an additional person — either mathematician or engineer — between the process designer and the computer only adds to the difficulties.

As they are developing better understanding of the limitations and capabilities of computers, chemical process engineers are becoming more adept at the use of computers. Computers are technically recognized as practical, problem-solving tools. A firm base has thus been established from which additional, rapid progress in chemical engineering techniques can be made. Needed improvement in the ease and speed of communication between engineers and computers is a vital factor and needs much attention.

A Management Policy

The really great benefits of computers will be derived, however, when all members of the management team feel secure in taking the point of view that:

- Experimental use of computers is expensive, and adequate budget outlays should be provided, much along research lines.
- biggest benefits will come to many companies through uses not understood or anticipated at present time.
- just as with fundamental research, basic exploration of computer use cannot be "efficient" nor can it necessarily provide hoped-for benefits with a "reasonable" timetable,
- a breakthrough is fine, but may be simply a matter of luck. Negative experiences should be regarded as vital know-how, and
- too-early "industry-wide" agreements as to what computers are and are not good for should be avoided.

Given such backing, the computer may well serve as a prime mover towards new heights of American processing creativity. ■

A management policy for computer progress

The full benefits from computers will be realized only when the management team agrees to:

- **Provide adequate outlays for computer experimentation.**
- **Look for biggest benefits from computer uses not even anticipated today.**
- **Use caution in setting timetables for commercial 'payoff' from basic exploration.**
- **Expect negative experiences and regard them as additions to vital know-how.**
- **Avoid early 'industry-wide' agreements as to what a computer can and cannot do.**

Air-cooled exchangers may solve your problem

If you as a manager are concerned with decreasing the capital needed for a planned expansion — if you as a process engineer are involved with heat exchangers — or if your responsibilities tie into both of these areas, we believe this account of Esso's experience with air-cooled heat exchangers will be invaluable to you.
This article continues CP's coverage of air-fin exchangers and the major change in engineering thinking regarding their use in areas near an ample water supply outside the Southwest.

Air-cooled exchangers cut capital needed for expansion

Experience on first large installation in a processing plant north of the Mason-Dixon line shows that air-fin coolers:

- **Eliminate need for new water mains**
- **Lessen corrosion**
- **Provide some interesting control problems**

GORDON WEYERMULLER
Petrochemical Editor
with **W. R. WHALEY**
Mechanical Engineer
Esso Standard Division,
Humble Oil & Refining Company
Linden, New Jersey

Prior to 1957 not a processing plant in the North had a major installation of air-fin heat exchangers, accepted engineering practice being to use water for cooling or condensing in these areas. In that year the Esso Bayway refinery at Linden, New Jersey, installed 17 twin air-cooled condensers in a pioneering move that was an important factor in the changed engineering thinking on this subject.

Successful performance of the initial units and later installations at Esso removed much of the skepticism re-

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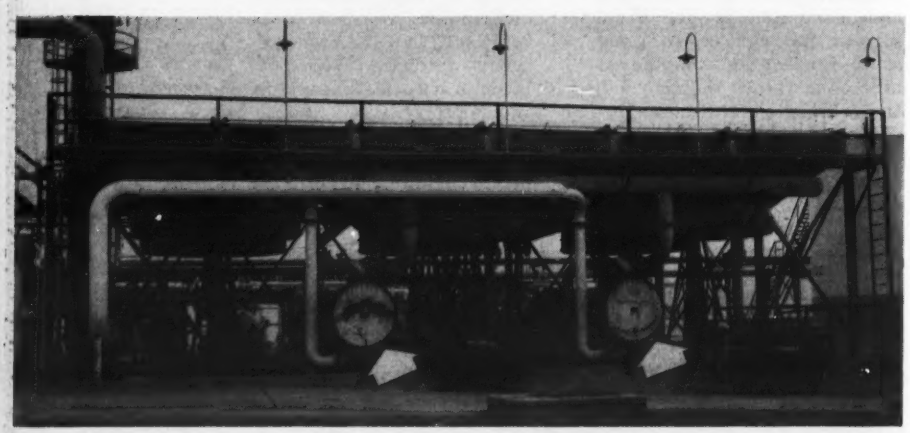
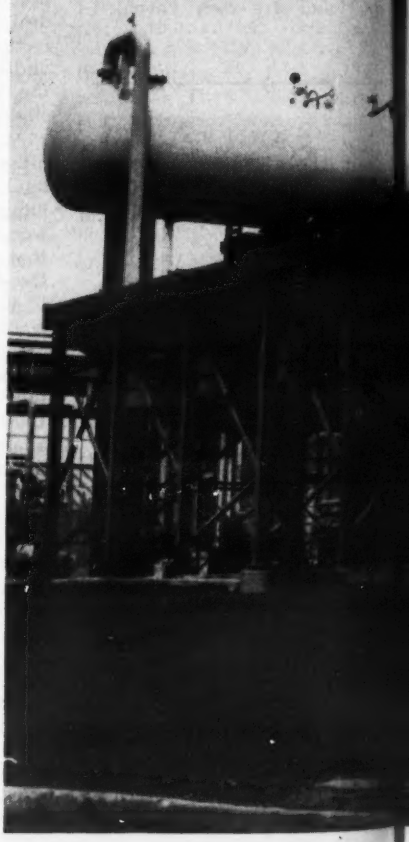
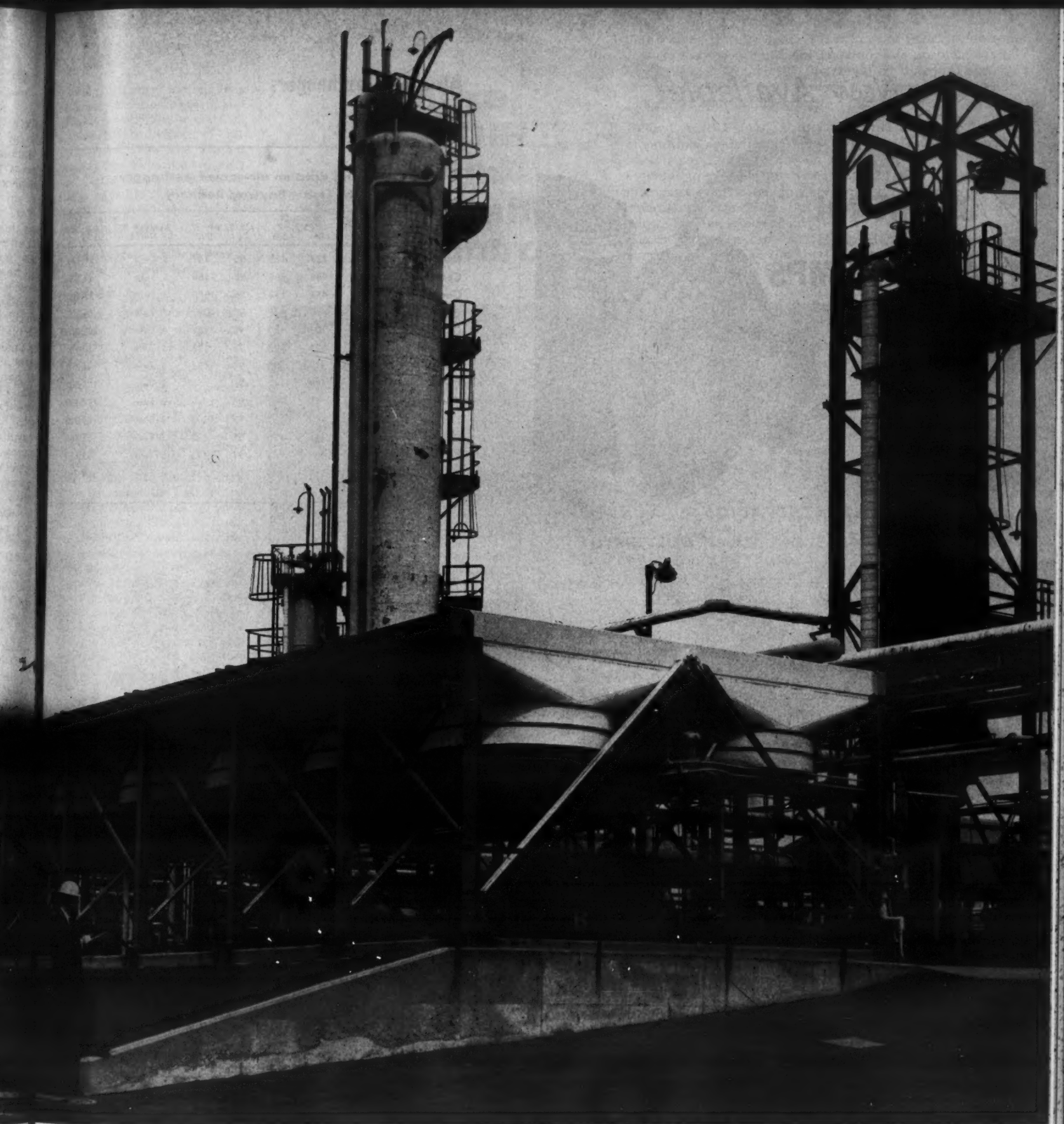


Hydrofiner at Esso uses 10 twin air-fin condensers employing 20 fans. Installation on grounds facilitate accessibility of units



Air-cooled condensers on alkylation unit uses trim coolers (conventional water-cooled heat exchangers, see arrows) to provide close temperature control. Trim coolers can also serve as a stand-by unit



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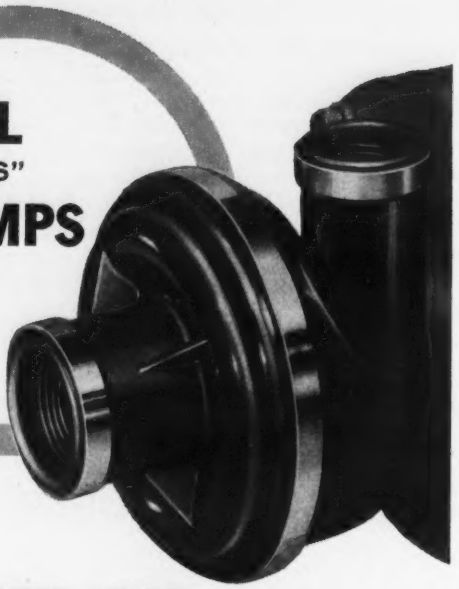

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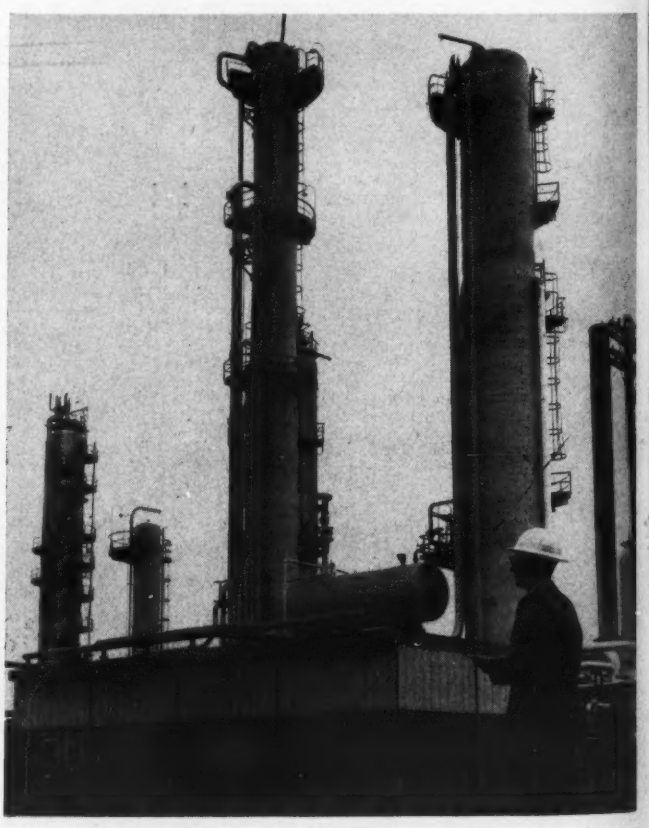
Check 4898 opposite last page.

Air-cooled exchangers . . .

From preceding page

Operating data on air-cooled exchangers at Esso's Bayway Refinery

COOLED OR CONDENSED	DUTY IN MILLION Btu/HR	PRODUCT TEMP, °F IN	PRODUCT TEMP, °F OUT	AIR TEMP, °F IN	AIR TEMP, °F OUT	NUMBER OF UNITS	TOTAL HEAT TRANSFER AREA SQ FT
Condensed	44.5	223	125	95	147	8 Twin	229,136
Cooled	8.6	430	385	95	158	1 Twin	12,305
Cooled	3.6	451	130	95	200	3 Twin	73,512
Cooled	17.6	630	130	95	287	1 Twin	56,200
Condensed	38.3	305	130	95	181	4 Twin	102,016
Cooled	5.1	223	120	95	138	1 Twin	20,474
Condensed	35.1	319	120	95	172	5 Twin	143,210
Condensed	18.2	147	142	95	—	2 Twin	115,000
Condensed	27.1	145	143	95	—	3 Twin	172,500
Condensed	17.7	203	167	95	—	2 Single	68,000
Cooled	14.9	166	130	95	132	1 Twin	62,480
Cooled	20.0	380	185	91	176	2 Twin	32,674
Condensed	70.0	159	140	90	135	4 Twin	309,360



In the late 1959 four twin air condensers were installed on the light ends unit, a completely new unit. Reason for use of air exchangers was still the same, insufficient salt-water cooling capacity in existing system

garding their use. Installations at Esso refineries abroad and at other companies in the U.S. confirmed the value of air exchangers. Now the Linden refinery has 40 twin air-cooled units in a variety of services. Let's examine the thinking behind the installation at Linden.

Air Exchangers Eliminate Need For Additional Water

In 1957 the Esso refinery built a new Powerformer, replacing another unit. Existing salt-water* system was not large enough for the new unit, which would require four times as much water: 14,000 gpm.

Consideration was given to increasing the capacity of the existing water system. This would have required construction of an additional water main the one-mile distance to the water front, along with added pumping facilities. Further, additional sewer capacity for the salt water would have been needed.

Comparison of incremental investment and anticipated maintenance requirements of water cooling versus a combination of air and water cooling led to the decision to cover the additional cooling requirements through air cooling.

Air Exchangers Advantageous For Expansion

It is in plant expansion that air coolers can be especially advantageous. Air cooling is limited to cooling applications with outlet temperatures not lower than 120°F. Further, it is frequently desirable to install a water cooler in series with an air cooler, for control or stand-by purposes. Thus a combination of air and water cooling may be required when air cooling is considered. In the expansion of water-cooled facilities the existing cooling-water capacity can be utilized to satisfy the water-cooling requirements and air cooling can be employed to cover the

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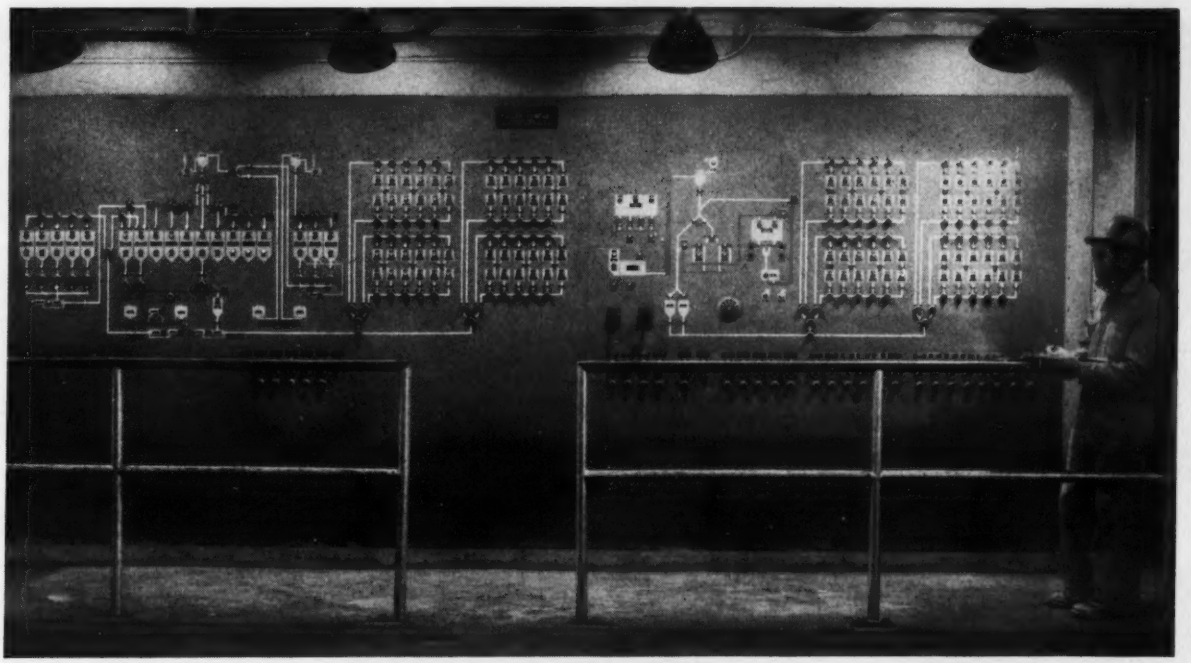
*Fresh water, recirculated through cooling towers, is not used in this refinery for process cooling, for economic reasons

More "PAY-DIRT" With Fuller Panels In Control

One man on watch—and a Fuller Control Panel in control. Result: the flow of bulk, dry materials in a pneumatic conveying system graphically illustrated by diagrams and indication lights that track process transitions from phase to phase—without human errors!

Fuller Control Panels—automatic, remote, one-man control of multiple operations—stem from Fuller's vast materials handling and instrumentation experience. Fuller, the only manufacturer of pneumatic conveying equipment engaged in engineering and building its own control panels, puts its cumulative experience into each project. This single knowledgeable responsibility for both system and control means savings in time and costs. More important—it's your assurance that the total system is generic to your specific operational needs.



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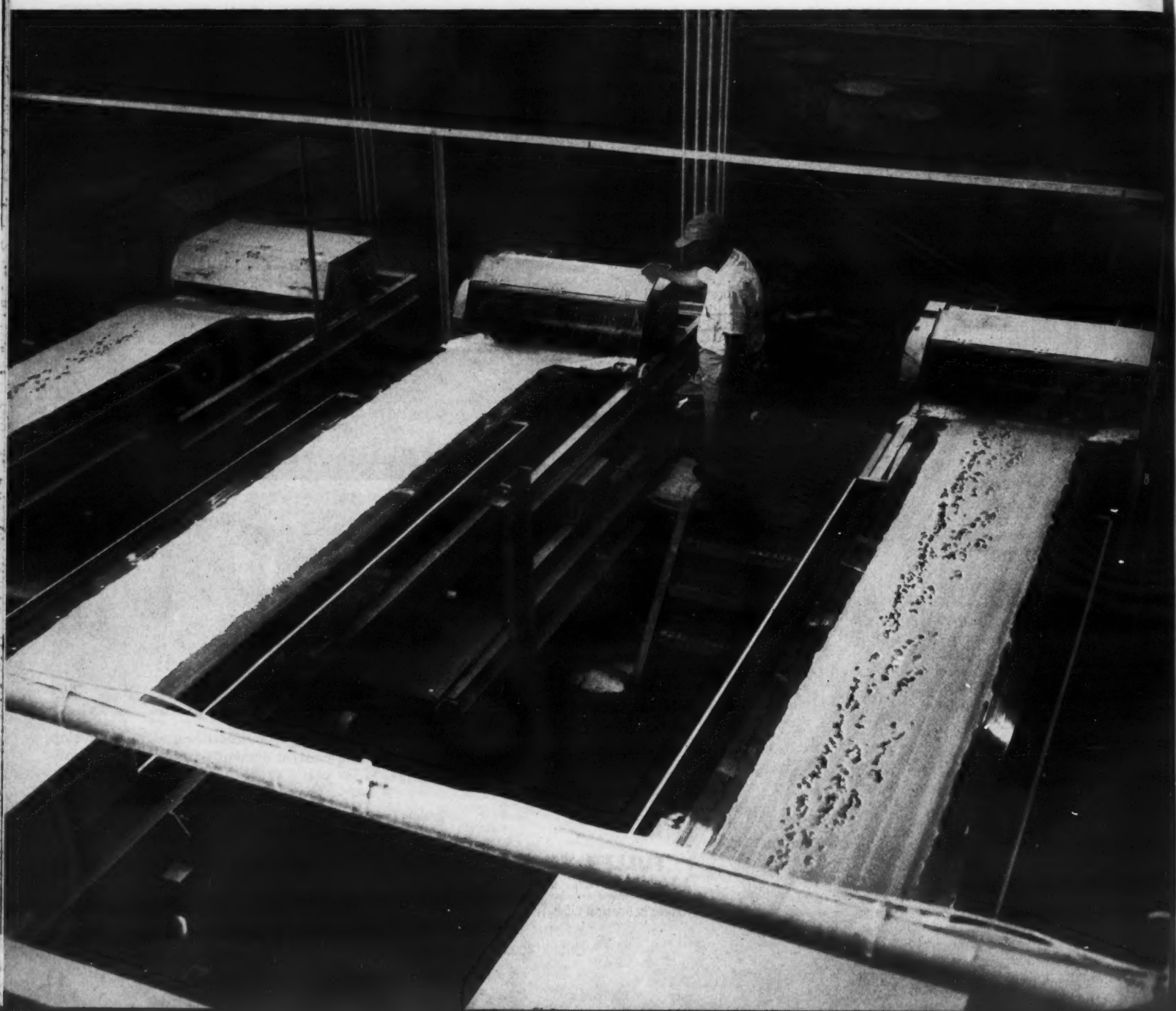
2635
CP-2

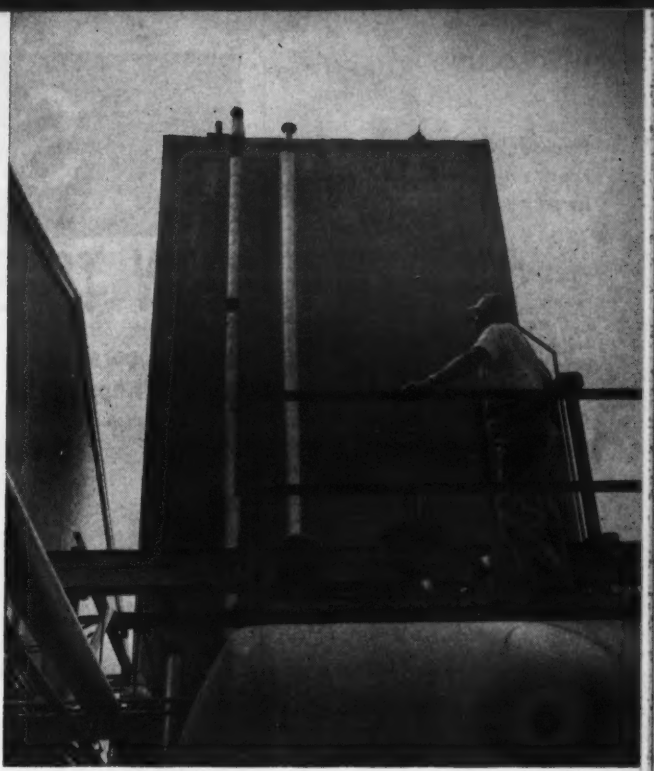
Check 4899 opposite last page.

Economical solution found for beating corrosion in Stengel ammonium nitrate process . . .

Teflon-lined pipe handles



boiling HNO_3 and hot NH_4NO_3



Fluoroflex-TS pipe at left carries HNO_3 from acid heat exchangers to top of reactor

Problem: Corrosion is a big "stumbling block" in the handling of 58% boiling nitric acid at 310°-333°F and 50 psi in manufacturing ammonium nitrate. High corrosive action of HNO_3 and, in other lines, molten NH_4NO_3 limits the use of materials of construction to very few.

In the Stengel process employed at the Joplin, Missouri, plant of Atlas Powder Company, ammonia vapors react with nitric acid to permit comparatively small amounts of the two products, steam and molten NH_4NO_3, to be removed continuously from the reactor, substantially as fast as formed. Small volume produced at any one time reduces the hazard of explosion and the system employs a relatively simple set-up.

Until late 1956, however, there was no inexpensive solution to the corrosion problems involved when using the Stengel process.

Solution: Late in 1956 Teflon-lined pipe provided a solution to the corrosion problem. Manufacturer of the pipe had tested sample spools over a period of several years and successfully showed that it would withstand extremely corrosive high temperatures in the presence of products as boiling nitric acid as well as hydrofluoric.

Atlas Powder installed Fluoroflex-TS pipe and fittings on the Stengel process in Joplin in 1958. These were placed while the new plant was then being built.

Manufacturer of the pipe and fittings has perfected a technique to form the nonporous Teflon liner over the face of the flange to form a self-sealing integral gasket. One of the properties of this Teflon liner is that it has an inherent thermal equilibrium which frees it from the effects of thermal expansion, shock and fatigue stress. This prevents buckling and cracking between the tube and the flared faces.

Results: Two years of continuous service of the Fluoroflex-TS piping system in the Joplin plant has been satisfactory.

A saving of over 85% was made in the initial installation as compared to the only other suitable material.

Maintenance savings elsewhere: In an installation cited at the 16th Annual Conference of the National Association of Corrosion Engineers, a maintenance saving of $350 thousand annually was shown in a replacement of other types of piping. Unscheduled maintenance was reduced more than 80%. Also, product losses were reduced and the plant capacity is increased to the extent of another $350 thousand annually.

Further economies can be effected in the use of Fluoroflex-TS because of its lower cost.

(Fluoroflex-TS pipe and fittings are products of Resistoflex Corporation, Roseland, New Jersey.)

Check 4900 opposite last page.

(Stengel process is licensed by Commercial Solvents Corp., 260 Madison Ave., New York 16, New York.)

Check 4901 opposite last page.

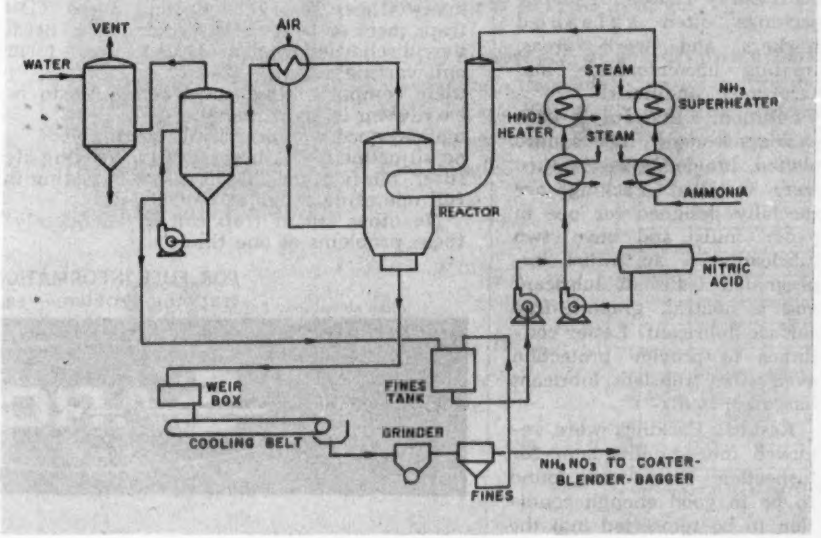
Ammonium nitrate solidifies and cools as it travels on stainless steel crystallizing belt

NH_4NO_3 via the Stengel process

In the typical Stengel process illustrated (there are variations in this arrangement at the Joplin installation), vaporized and super-heated liquid anhydrous ammonia (225°F) is introduced with nitric acid (containing dissolved ammonium nitrate fines) at 350-450°F into the top of the reactor.

Reaction product passes to a separator where heated air is introduced to reduce water content. Molten ammonium nitrate is removed from the bottom of the reactor. Air to the reactor is heated to 400°F by exchange with the separator overhead product. It is blown up through the molten salt and carries with it water vapor. This reduces the water content of the molten ammonium nitrate to less than 0.2%.

Air leaving the stripper carries with it a small amount of entrained ammonium nitrate. This is removed by scrubbing the air in a partial condenser to remove ammonium nitrate and traces of ammonia. Concentrated liquor thus obtained is recycled to be used as a solvent in the fines dissolving tank.



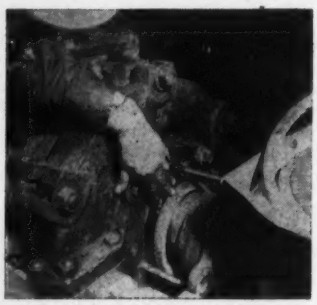
Packing life boosted from two to 20 weeks in paper mill

Cut maintenance time and expense

Problem: Conventional packings used on hydrapulpers, Jordan machines and breaker traps at large eastern paper mill had average life of only two weeks. Intense friction and abrasive conditions caused lubricant contained in packing to progressively dissipate.

Continual adjustment was needed to tighten pressure on packing. This also squeezed lubricant from packing, causing dry spots which scored moving parts.

Allied to problem of lubricant loss, was almost constant leaking and spilling of hot fluids and shredded paper on



Packing being placed into packing gland of Jordan machine

floor. Spray caused by faulty packings often splashed workers and work areas, creating uncomfortable and hazardous conditions.

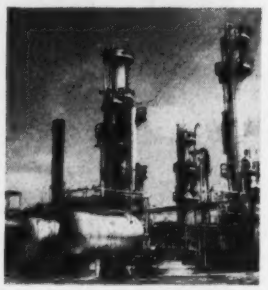
Solution: In July 1959, packings made of square plaited, braided asbestos yarn were installed. Packings are specially designed for use in paper mills and have two lubricants — an initial impregnated transient lubricant and a neutral, graphite-free surface lubricant. Latter continues to provide protection even after transient lubricant has dissipated.

Results: Packings were removed four months later for inspection. They were found to be in good enough condition to be reinserted into the

SARCO TOPICS

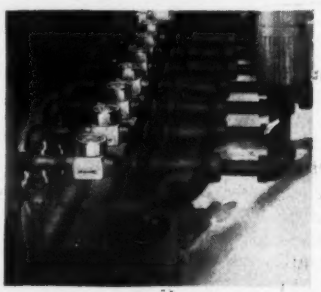
HOW TO SOLVE COMMON TRACER LINE PROBLEMS

How to cure water hammer with a steam trap that will operate in vertical position



Water hammer is an inherent problem in long tracer lines. So is freezing. Both problems can be overcome, and here's an example of how it has been done. At the Socony Mobil Oil Company's Paulsboro, N.J., refinery, they found that the Sarco Thermo-Dynamic Steam Trap, type TD-50, not only withstands water hammer, but installing the trap in a vertical position —which permits free drainage—presents no problems at all, thanks to its unique thermodynamic principle. In fact, 90% of the 250 TD-50's at this plant are vertically mounted. They never block heat transfer, and they remove condensate and air as fast as they collect.

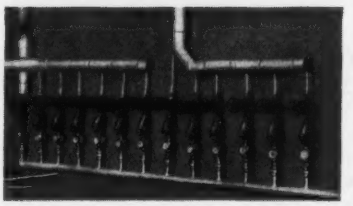
How to handle varied steam pressures — without adjustment



Can a trap — without adjustment — handle steam pressures that vary from 15 to 160 psi? Can the *same* trap vent air and drain condensate as rapidly as it is formed, be easy to install and require practically no maintenance at all? That was the problem set up by the engineering staff of Armour Chemical Division's McCook plant. They solved it by testing many traps. Their conclusion: Sarco TD-50 steam traps meet or beat their specifications, because:
they discharged condensate as fast as it formed, without wasting steam;
their compact inline construction made installation easy, even in tight quarters;
maintenance was practically negligible;
no adjustment was necessary for varying steam pressures. (In fact, the TD-50 is self-adjusting through its full operating range of 10-600 psi.)

No other steam trap can so adequately solve all these problems at one time.

How to be certain process fluid stays above 280° F. when outside temperature drops to —10° F.



The problem of maintaining design temperatures on tracer lines need not be difficult, no matter how extreme the conditions seem to be. For example, the tracer lines in a phthalic anhydride process at Witco Chemical Company's new Chicago plant had to be maintained above 280° F. Below this temperature, the chemical sets and the whole system would have to be taken apart and re-assembled. That's not all; ambient temperatures sometimes could drop to —10° F.

With reliability as a prime consideration, Scientific Design Company, Inc., who designed and constructed this brand new plant, selected the TD-50.

Because the TD-50 can be mounted vertically, freezing was no problem either. Added benefits that matter on tracer lines: the TD-50 is compact, light in weight, easy to install.

What is the most reliable tracer line trapping method to prevent unscheduled shutdown?

Particularly in refineries, steam traps have to function under exactly the kind of conditions that you'd expect to cause failure—they must function equally satisfactorily on low pressure or exhaust steam and on up through high-pressure, high temperature ranges. Not only that, but outside temperature may vary from subzero to subtropical. If maintaining design temperatures in your tracer lines appears to be hampered by these problems, consider how Phillips Petroleum Company, Kansas City, solved them. They found a trap which drains their tracer lines automatically over a full range of pressure, temperatures and loads. It's the Sarco TD-50 Steam Trap.

With only one moving part—a stainless steel disc, the TD-50 has little that can go wrong. In fact, it's so free of trouble that Phillips Petroleum Company consider their TD-50's as reliable and efficient as the piping. They now rely on 1800 of them throughout the plant. 1408

FOR FULL INFORMATION ON TRACER LINE TRAPPING or on any steam trapping problem—see your Sarco Sales Representative or write to

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635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

SARCO

Here are 7 Sound Reasons Why the Thermo-Dynamic® Does a Better Job of Trapping

1. *Simplicity*—has only one moving part. 2. *Maintenance*—practically zero. 3. *Wide pressure range*—one trap for all pressures from 10 to 600 psi. 4. *Uniform performance*—operates equally well on heavy, light, or no condensate load. 5. *Operates against back pressures*—up to 50% of inlet pressure. 6. *Rugged*—unaffected by superheat, water hammer, vibration, or corrosive condensate. 7. *Minimizes inventory* of spare parts.

Maintenance Time: 40 Seconds. If it now takes your maintenance crew more than a couple of minutes to service an ordinary trap, you're throwing away valuable time. This Sarco Thermo-Dynamic can be cleaned, blown out if necessary, and reassembled on the line in as little as 40 seconds.

For Prompt Information on the TD-50 . . . or for fast help on the efficient solution of any steam trapping problems, get in touch with a SARCO District Office, Sales Representative, or Distributor. (There's one near you.)

Only SARCO makes all 5 types:
Thermo-Dynamic* • Thermostatic • Liquid Expansion • Float Thermostatic • Inverted Bucket

*U.S. Pat. No. 2,817,353 TM Reg. U.S. Pat. Off.

1409

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SARCO COMPANY, INC.
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PLANT BETHLEHEM PA

Check 4902 opposite last page.

machine. Further tests showed that packings had life of at least 20 weeks—as compared with previous material's two weeks.

Based on two hours total time needed for changing packings in hydrapulper and Jordon and 1½ hours for breaker trap, company now saves at least nine changes, or minimum of 31 hours maintenance time every 20 weeks.

(RM No. 363 packings are product of Raybestos-Manhattan, Inc., Packing Division, Passaic, New Jersey.)

Check 4903 opposite last page.

Tantalum polyester pipe whips HCl leakage at Diamond Alkali

Problem: Excessive leaks in steel-jacketed tantalum HCl line caused downtime and considerable production loss at Diamond Alkali Company, Painesville, Ohio. Line was 6" in diam and had a length of 17½'. Tantalum wall thickness was 0.013".

Function of line was to recycle hot 20% stripper acid. Leaks occurred at gasketed joints. Eventually, acid destroyed most of flange-faces.

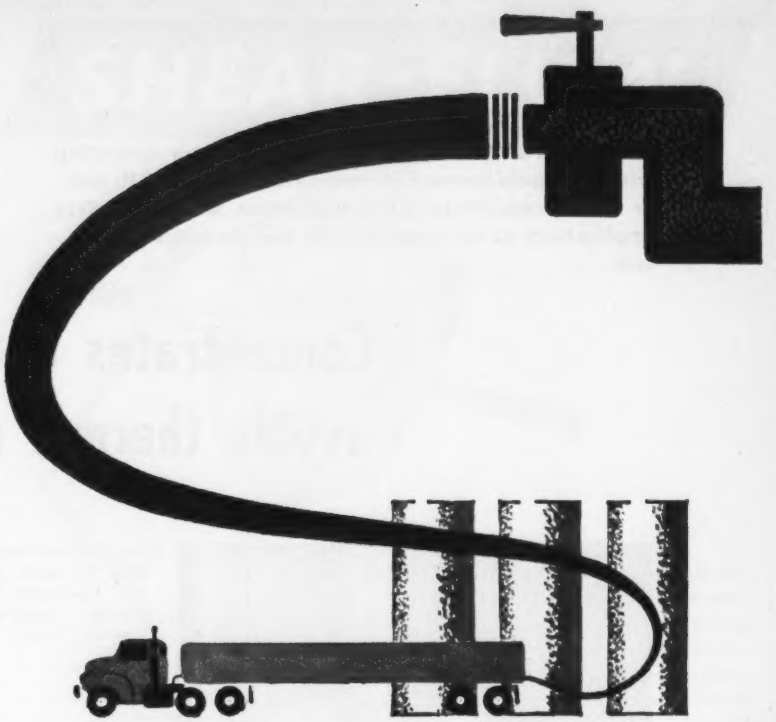
Solution: The pipe was replaced by a one-piece tantalum line covered with 0.25" layer of polyester glass fiber. Addition of the glass fiber provided line with sufficient strength to carry the acid.

Combination also gives pipe enough flexibility to take care of any movement caused by shifting and expansion. Tantalum from the old line was salvaged and used for the new pipe. Steel covering was removed by dissolving it in acid.

Results: The one-piece line has shown no signs of leakage since its installation in 1957. Polyester glass fiber resists HCl fumes, needs no painting and protects tantalum from mechanical damage.

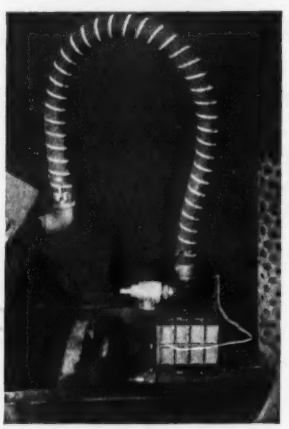
(Further information about tantalum-polyester pipe may be obtained from Metals-Fabrication Division, Fansteel Metallurgical Corporation, North Chicago, Illinois.)

Check 4904 opposite last page.



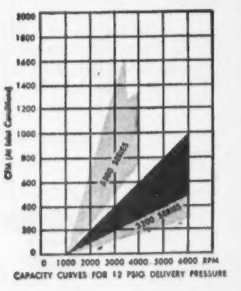
NEW M-D GEARED P.T.O. BLOWERS . . . NO BELTS-NO PULLEYS

for tractor mounted conveyor systems



Now a compact, 3-lobe M-D blower fits *inside* tractor frame . . . weighs only 165 lbs. Geared-in-head blower (2 to 1 or 2½ to 1 ratios) connects directly to truck P.T.O.—no belts or pulleys—develops 15 PSIG continuous air flow or up to 18 PSIG in surges.

M-D blowers operate at wider pressure and speed ranges than any other rotary positive blower. Capacities of 22 production models range from 50 to 4,000 CFM, pressures to 15 PSIG single, 70 PSIG multi-stage.



md

For full information write

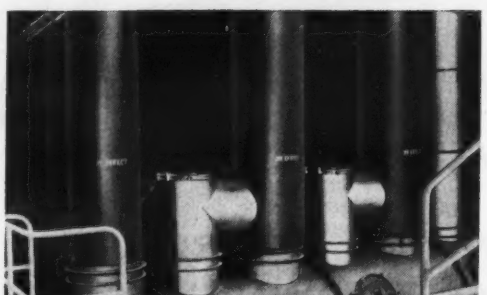
M-D BLOWERS, INC.
RACINE, WISCONSIN

A SUBSIDIARY OF MAD MIEHLE-GOSS-DEXTER, INC.

Check 4905 opposite last page.

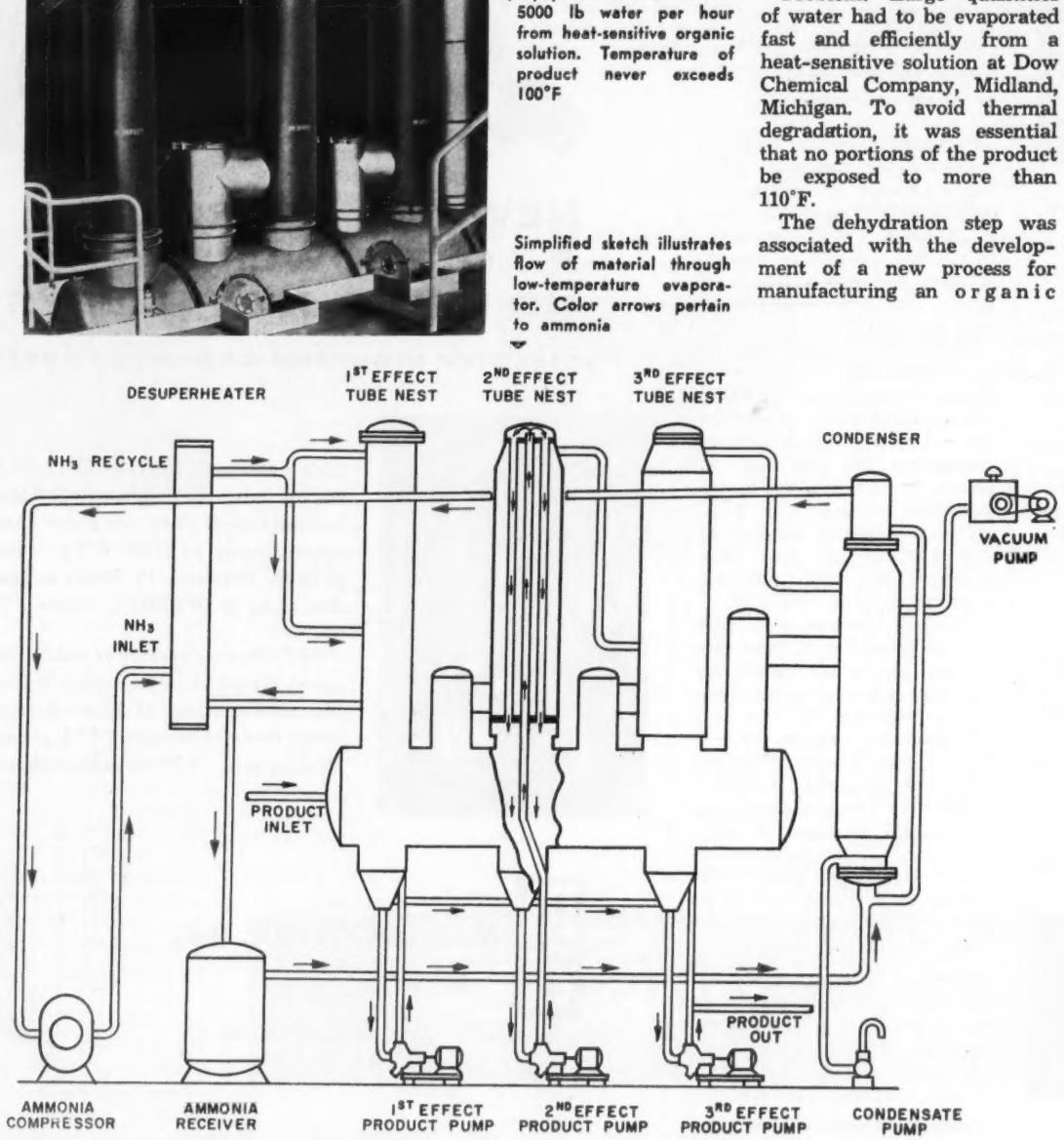
AT DOW CHEMICAL, 'heat pump' evaporator operating with ammonia instead of steam removes 5000 lb per hr water from dilute polymer solution. One of the first applications of the equipment in the chemical field, unit . . .

• Concentrates heat sensitives below 100°F
• avoids thermal degradation



Equipment at Dow removes 5000 lb water per hour from heat-sensitive organic solution. Temperature of product never exceeds 100°F

Simplified sketch illustrates flow of material through low-temperature evaporator. Color arrows pertain to ammonia



Problem: Large quantities of water had to be evaporated fast and efficiently from a heat-sensitive solution at Dow Chemical Company, Midland, Michigan. To avoid thermal degradation, it was essential that no portions of the product be exposed to more than 110°F.

The dehydration step was associated with the development of a new process for manufacturing an organic polymer. Plans were to concentrate over 5000 lb of dilute solution per hour — boosting solids content from five to 40 percent.

Since the process was going to be an around-the-clock operation, low operating costs were one of the prime economic objectives.

Solution: Extensive laboratory and pilot plant investigations resulted in the selection of an efficient heat-pump system of distillation. Design permits mechanical compression energy to transfer heat from condensing product vapors to evaporating product. This is reported to be one of the first applications of this equipment in the chemical field. Similar but smaller units have been used in the food industry for evaporating milk and other liquids.

Equipment is a triple-effect, falling-film evaporator operating with compressed ammonia vapor instead of steam. The evaporator can be pictured as being the reverse of an ordinary refrigerator. Power is needed only for compressor and vacuum and circulating pumps.

All three stages function under vacuum — first at 38 mm, second at 28 and third at 18. Each effect consists of a 42″-OD x 20′ chamber containing over 200 1″-diam x 20′ stainless tubes. Vacuum can be established by vacuum pump or steam jets. A six-cylinder, 174-cfm, 900-rpm compressor provides 250 psi ammonia. Unit is powered by 75-hp motor.

In operation, recycled

ammonia vapor at 250 psi and 110°F enters first stage. Solution being processed enters unit at 80°F and flows down tubes which are surrounded by ammonia vapor. Water evaporates from product at 100°F. Ammonia, after giving off latent heat to the solution, changes into liquid at 106°F and is piped to receiver.

Water vapor removed from first stage supplies heat to second effect. Solution from first stage enters second effect through bottom and is pumped to top of chamber. It then flows down through nest of tubes. Water flashes off at 90°F.

Process is repeated in third stage. Water evaporates at 80°F. Concentrated product is withdrawn and pumped to adjacent area for further processing. Water vapor from third effect condenses in shell side of vertical shell-and-tube heat exchanger and is discharged to sewer.

Ammonia at 133 psi and 72°F in tube side picks up the latent heat and vaporizes. It then returns to the compressor where it's boosted once again to 250 psi and superheated to about 157°F. Prior to entering evaporator's first effect, the ammonia is passed through a desuperheater which removes excess heat of compression and cuts temperature down to 110°F.

Results: The equipment effectively evaporates the desired amount of water from the delicate solution without danger of heat damage occurring. Temperature of product never exceeds 100°F — safely below the 110°F maximum limit. The low temperature also minimizes possibility of undesirable side reactions.

Material flow through the evaporator per 5715 lb feed, disregarding insignificant flash evaporation, is approximately as follows:

1) 5715 lb 5% solids solution enters first effect at 80°F
   1666 lb evaporation in first effect at 100°F, to second effect
2) 4049 lb 7% solids solution flows from 1st to second effect
   1667 lb evaporation in second effect at 90°F to third effect
3) 2382 lb 12% solids solution flows from second to third effect
   1667 lb evaporation in third effect at 80°F to condenser
4) 715 lb 40% solids solution discharged from evaporator

Total evaporation: 1 + 2 + 3 = 5000 lb

According to the manufacturer of the equipment, the heat pump used in this size unit requires approximately 60 kwh per 5000 lb of water evaporated, or 12 kwh per 1000 lb.

Dow currently has total of three such units operating at the Midland plant. Production capacities of the others are somewhat different, but performance is proportionally about the same. All are in continuous operation and giving good service at minimum cost. Maintenance needs, other than routine, have been negligible.

(Further information about Lo-Temp evaporators may be obtained from Mojonnier Bros. Co., 4601 West Ohio Street, Chicago 44, Illinois.)

Check 4906 opposite last page.

"You don't mean it?"

SHEAR-FLOW

Shear-Flow's high shear action produces finer, faster blending, dispersing and homogenizing. The new Model RL Shear-Flow portable mixer represents a major advance in mixer design. The new Hi-Shear Head consists of two rotating impellers and two stationary stators enclosed in a cylindrical housing. The fine clearance between impellers and stators results in rapid shearing action and a high degree of turbulence, resulting in a more complete reduction of agglomerates within the mixture.

- Greatly reduces mixing time
- Uniform circulation—no vortex
- Emulsifies immiscible liquids
- Controllable flow pattern
- Chemically inert seals
- Handles viscous materials with ease
- No operating torque

HAS A GOOD HEAD FOR BUSINESS

Close tolerances between impellers and stators promotes high shear for reduction and dispersion of material.

Adjustable deflector plate controls flow pattern for desired mixing action and air entrainment.

Three basic portable models for processing 1 to 250 gals. plus continuous mix units for high volume processing.

Write today for complete information on the Shear-Flow line of mixers.

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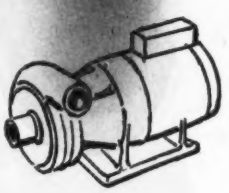
When You Need the RIGHT RING!

Allpax is the answer because Allpax can supply the right ring for each packing requirement whether it be on valve or pump. We make the right kind!

Allpax Rings are furnished to desired specifications in either molded, endless form or mandrel cut form with butt or mitre joints.

✔ ***For manufacturers —***

Allpax Rings cut costs and do a better job because they are precision-made in a complete range of sizes and a wide variety of materials. Right types available for each pump or valve requirement for whatever material handled.



✔ ***For replacement —***

Accurate dimensions and proper types make replacement easier — insure a tight seal without danger of scoring or unnecessary wear on shafts or valve stems.

There are Allpax Rings for:

GENERAL SERVICE
PETROLEUM SERVICE
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HIGH and LOW TEMPERATURE
ACID and CHEMICAL SERVICE
WATER, AIR ETC.

also TEFLON "V" and "O" RINGS

Each ring precision-made to exacting packing requirements

ALLPAX

"The Packing that Packs All"

SEND FOR OUR NEW CATALOG — *TODAY!*

A complete line of packing, tools, gasket materials
Ask for dealer information and price schedules.

THE ALLPAX COMPANY, INC.
160 Jefferson Ave., Mamaroneck, N. Y.

Check 4908 opposite last page.

NEW SOLUTIONS

Combination barge . . .

. . . is capable of simultaneously hauling 546,000 gal of petrochemicals along with 504,000 gal of pertochemicals. Built for Sinclair, the 250 ft long barge has all-welded steel construction. Center line tanks carry chemicals. Petroleum products are carried in wing compartments. All gasket and packing material used in pertochemical pipe and pumping system are either Teflon or Teflon impregnated.

(Information courtesy of Sinclair Refining Company, 600 Fifth Avenue, New York 20, New York.)

Battery handling speeded by use of PVC roller conveyor network

Eliminates push-tables, resists acid attack

Problem: Sulfuric acid was attacking metal rollers on conveying system used along portions of storage battery production line at Scranton Battery Company, Scranton, Pa. Metal push-tables and plant's concrete floor were also suffering from corrosion. Battery handling was slow and awkward, equipment losses severe. A new concrete floor, over which the push-tables were rolled, was ruined in eight years.

Solution: A conveyor system using PVC rollers was installed throughout the entire plant. Rollers consist of schedule 40, 1½" diam PVC pipe and vary in length from 8 to 16". Plastic bushings cemented inside roller ends accommodate roller axles which are fabricated from Schedule 80, ¼" pipe.

Total length of conveyor system is 2650 ft. Rollers can easily withstand operational loads of 80 to 120 lb at tem-

FIGHT FOAM FAST! with SAG SILICONE ANTIFOAM

CHEMICAL processors who use SAG Silicone Antifoam have made tremendous strides in fighting or controlling foam in many applications.

After a recent trial of SAG 47 Antifoam in a chemical plant, one customer reported: "This proves to be an excellent product for us. It requires smaller concentrations than previously used competitive products because of its lower viscosity and excellent dispersibility."

Years of research went into development of SAG Antifoams to make them *fight foam fast*. There are three types: SAG 470 Emulsion for aqueous systems; SAG 47 Fluid for non-aqueous systems; SAG 471 Fluid for durability in systems employing vigorous agitation. All products are shipped ready to use. And they're stable in storage. Mail coupon today for samples and technical information.

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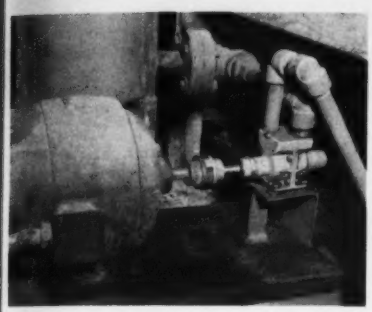
ECO ENGINEERING NEWS

the big name in small pumps for the process industries

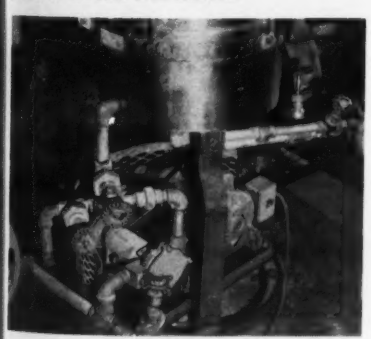
Seven Years Hard Service Only Repair, Seal Replacement



True Brite Chemical Products Co., Oakville, Conn., producers of sodium and potassium copper cyanides and other essentials for metals finishing, are long-time users of Eco Pumps.

Their satisfaction stems from such performances as that of the Eco ALL-CHEM pump pictured above, pumping sulphates and dilute sulphuric acid to a rotary vacuum filter. In seven years of continuous intermittent service, the only attention required has been a replacement of the gland packing.

This 316 stainless steel pump has now been relieved by another Eco ALL-CHEM (True Brite keeps replacements on hand for each Eco pump in case of emergency need), while the old pump is being equipped with new Teflon† interchangeable rotors and sleeve bearings, ready for another seven years of trouble-free service.



This Eco CENTRI-CHEM Pump at True Brite feeds sodium copper cyanide (double salts) to one of the dryers employed in this plant. All filters and dryers are Eco pump equipped and, according to President Henry Strow, they have been found to be the best pumps available for the services involved.

†du Pont Trade mark

Eco Pumps Protect Clarity, Color and Un-contaminated Purity of Pharmaceuticals

Pharmaceutical Industries, Inc., Merchantville, N. J., ship world-wide such products as Liposal for treating infantile eczema and asthma; Polymul, an infant fat modifier; and Donic for reducing cholesterol—a "heart-felt" blessing to many of us.

Employ Nitrogen Atmosphere

The preparation of these pharmaceuticals requires extremely exacting processing, since they are made from highly unsaturated vegetable and marine oils which are very oxygen labile.

Processing is carried on in a nitrogen atmosphere of about 2 psi above normal atmosphere.

Both Eco ALL-CHEM Pumps and GEARCHEM Pumps of 316 stainless steel with Teflon trim and gland seals are used to handle the component materials and the finished products—which are packaged in transparent individual dispensules revealing color and clarity of dosage.

Four Years "Uneventful" Service

The two Eco ALL-CHEM Pumps, illustrated above, have handled more than a quarter million gallons of oxygen labile pharmaceuticals during the past 4 years of uneventful continuous service.

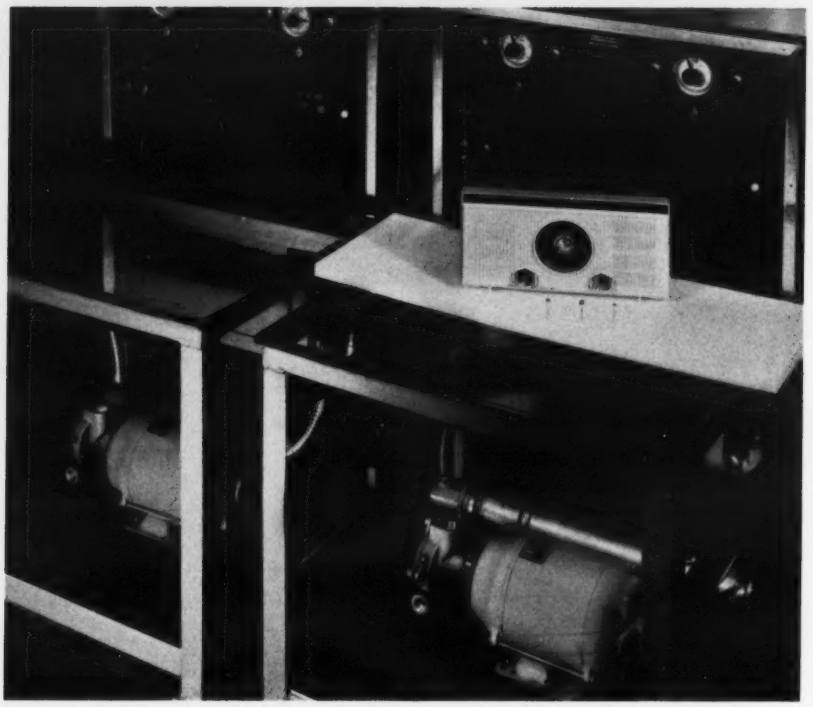
Pumps Very Satisfactory

"These Eco Pumps have proven very satisfactory," says Dr. Worne of Pharmaceutical Industries. "They provide beautiful suction lift where required, offer no contamination problem either from air ingress into the system or from materials of construction, and supply continuous, linear flows most suitable to our needs."

"We now have standardized on Eco Pumps —following an early unfortunate experience with centrifugals of another make."

Close-up of one of the Eco ALL-CHEM 1750 rpm direct motor driven units at Pharmaceutical Industries, Inc.

"BEST PUMPS IN THE PLANT", *Say Sylvania Maintenance Men*



New Sylvania Production Units for processing Radio Transistors, being equipped with Eco CENTRI-CHEM Pumps

This is a story of pump economics. Sylvania Electric Company, Division of International Telephone and Telegraph Company, were using an inexpensive make of pumps in recirculating systems containing dilute hydrogen peroxide in warm water. However, low first cost was soon offset by extensive maintenance and expensive loss in production time.

Studied Advantages

Sylvania and Eco engineers discussed in detail the advantages of high nickel alloys and Teflon-ceramic mechanical seals, as used in the Eco CENTRI-CHEM centrifugal before trying out the first Eco pump.

Results Pay Off

The savings were apparent from the beginning as there have been no pump breakdowns or replacement parts required, no interruptions of production—although these pumps operate twenty-four hours a day, six days a week, and some of them have now been in service for more than 2 years.

Successful pump installations don't just happen. They are planned. This typical Eco success story highlights two important advantages of doing business with Eco—good products and close cooperation between Eco and customer engineers to insure sound application economics.

Standardize on Eco

Sylvania now standardizes on Eco CENTRI-CHEM Pumps for all similar pump requirements in their multi-plant complex and Sylvania maintenance men refer to them as, "The best pumps in the plant."

ECO Products for Handling Corrosive and Hazardous Processing Fluids

ALL-CHEM® Rotary Pumps
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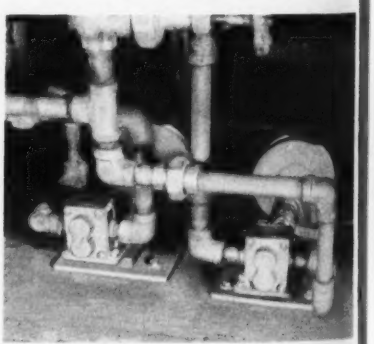
Circulating Caustic and Nitric Acid Baths in Wire Finishing



Side by side, these two identical GEARCHEM Pumps, sharing the same motor, pump media at opposite ends of the pH scale, simultaneously. They are 316 stainless steel, equipped with Hastelloy*C gears for corrosion resistance in both acid and caustic environments, and also to withstand the abrasion of fragments of metal remaining from the wire drawing operations, which accumulate in the baths.

*T.M. Union Carbide Corp.

peratures ranging from 72 to 140°F. When tested at heavier loads of 380 to 400 lb, roller deflection was approximately 1.5", with immediate spring-back to original form when load was removed.

Results: The PVC roller conveyor system has streamlined entire storage battery handling operation — from assembly through charging, refilling and finishing. The awkward push-tables are no longer used. The punishing combination of abrasion and sulfuric acid seems to have no adverse effect on the PVC rollers. They are still in good condition after more than a year of service.

(PVC pipe used for roller assembly was manufactured by A. M. Byers Company, 1810 Clark Building, Pittsburgh 22, Pennsylvania.)

Check 4910 opposite last page.

Seamless steel pipe carries brine supply through swamp

Fourteen miles of 6" diam steel pipe installed in Louisiana swampland, is delivering brine solution to Kaiser Aluminum & Chemical Corporation's alumina extraction plant at Gramercy. The 18.97-lb black seamless pipe was coated and wrapped prior to being trucked to the job site. Joints were welded as it was laid in ditch along right-of-way.

Kaiser's electrolytic caustic-chlorine plant is designed to produce 40,000 tons of caustic soda and 36,500 tons of chlorine annually. Brine is obtained by pumping fresh water into a salt dome near Sorrento, La., and piping the solution to the 350-acre Gramercy site.

(Black seamless steel pipe was manufactured by Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania.)

Check 4911 opposite last page.

For more information on product at left, specify 4912 . . . see information request blank opposite last page.

Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.

2. Be sure it's sized right and is for the correct operating pressure.

3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.

2. Install a test valve.

3. Use a union or unions.

4. Use a shutoff valve or valves.

5. Use a strainer ahead of the trap if dirt conditions are bad.

6. Use a by-pass only where continuity of service is imperative.

7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)

2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

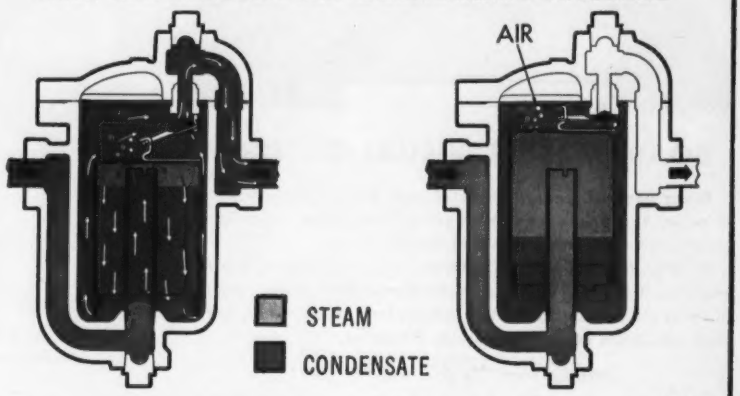
Good traps save steam and reduce the load (and consequently maintenance) on fuel handling and burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid —less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

HERE'S THE STEAM TRAP DESIGN THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.

3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.

4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.

5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

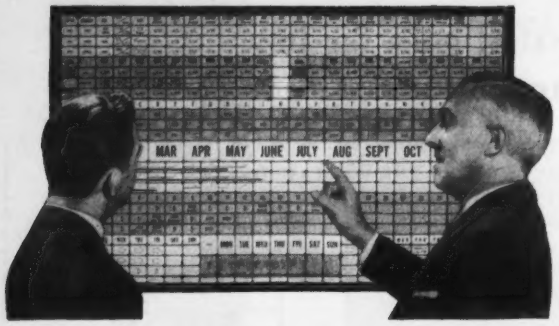
Armstrong Machine Works
8801 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

See our catalog in CHEMICAL ENGINEERING CATALOG.

Check 4913 opposite last page.

How To Get Things Done



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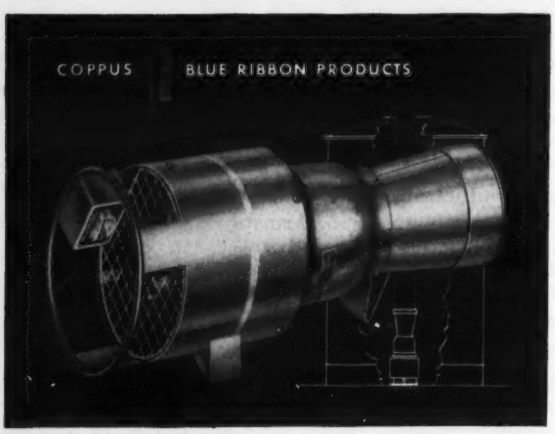

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NEW SOLUTIONS
of processing problems

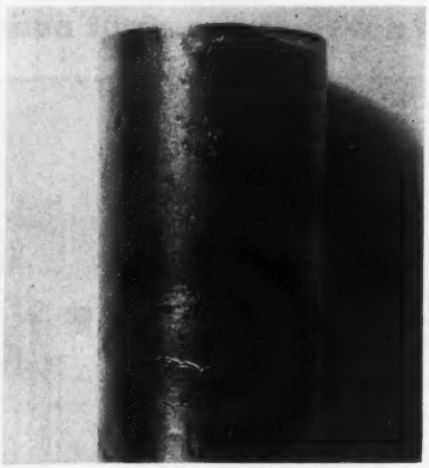
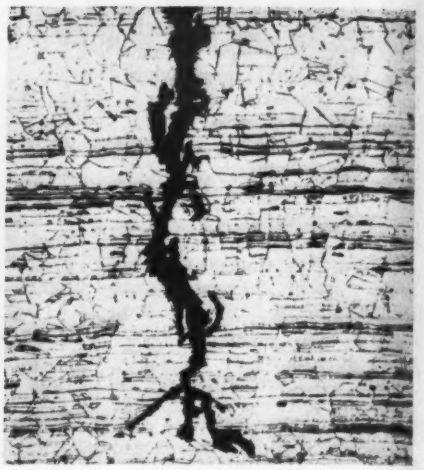


Illustration of stress cracking found in austenitic stainless steels after service in brackish cooling water



Photomicrograph, magnified 250X, reveals details of stress corrosion crack in austenitic stainless steel

Union Carbide stops condenser failures with bimetallic tube

Copper/stainless steel combination is expected to quadruple service life, save at least $50,000

WILLIAM ASHBAUGH, Corrosion Engineer
Union Carbide Chemicals Company, Texas City, Texas
with **CP STAFF**

Problem: Stress corrosion cracking and pitting caused frequent failures in battery of seven stainless steel heat exchangers at the Texas City, Texas, plant of Union Carbide Chemicals Company. The units, all vertical condensers, handle corrosive 302°F process gases on tube side and treated brackish 104°F river water on shell side.

Each condenser contains 475 tubes, ¾" OD by 12' long. Tubes have to be made of austenitic stainless steel to guard against corrosion and safeguard purity of product. There was no attack on tube side; all the trouble occurred on cooling water side.

Cost of replacing tubes on a heat exchanger is between $10,000 and $15,000. Rebuilding the bundle amounts to another $800 or $1000. Production losses during each period of repair were estimated at $2000 to $3000. Total cost of replacement: $12,800 to $19,000.

Various kinds — including some special grades — of stainless steel were tried, but none lasted slightly more than two years. Other high alloyed materials were considered, but dismissed as being too expensive. More extensive treatment of process water (pH was being controlled with H_2SO_4, chromate inhibitors were used to minimize corrosion of carbon steel components in the condensers) was also economically impractical.

Solution: Investigation revealed that high temperature and scaling were responsible for the stress corrosion and cracking. Cold water hitting the hot tubes would cause dissolved salts to precipitate and deposit on tubes. The salt scale would build up and act as insulation — making tube surface still hotter and accelerating corrosion and cracking. In every instance, attack was concentrated at top of condensers where temperatures were highest.

Water analysis showed that chloride content ranged between 200 to 500 ppm. Knowing that copper is resistant to chlo-

ride ions and accepting the fact that stainless steel was necessary for the process, the company decided to combine the advantages of both materials.

A condenser was installed having bimetallic tubes — 18-gage, type 304, welded stainless tube on inside, mechanically bonded to 0.0035" deoxidized copper on outside. Type-304 ferrules were used on ends of tubes to give tube side (process side) an all-stainless steel surface. Shell was also made of type 304 stainless. Brass was used for baffles. As with previous units, condenser was designed with top floating and bottom fixed heads.

Results: The bimetallic tubes have been in uninterrupted service for more than four years — and are still going strong. They have already lasted twice as long as the most effective bare tubes used previously. Other than an occasional flushing of the shell side with cleaning acid, no maintenance is required.

What is more important, engineers expect the bimetallic tubes to last at least eight or 10 years. Using previous condenser replacement rate of once every two years at cost of $12,800 to $19,000 as a basis, the total savings, pro-rated over life expectancy of the bimetallic tubes, could amount to at least $51,200 for eight years, or maximum of $95,000 for 10 years of trouble-free service.

(Copper-on-stainless tubes are product of Alloy Tube Division, The Carpenter Steel Co., Union, New Jersey.)

Check 4916 opposite last page.

NEXT MONTH

Faced with a sticky filtering problem? Then be sure to see next month's article about the rotary-drum units handling corn grits at A. E. Staley. Equipped with mechanism that automatically removes and washes belt during every rotation, filters maintain peak efficiency and make a tough job look easy.

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Check 4917 opposite last page.

When the going gets hot—when temperatures range to 1700°F. —Garden City's combination of "AIR-COOLED" Shaft and Thermal-Aire Fans can't be beat. "Built-in" protection of "AIR-COOLED" Shaft keeps bearings running cool when operating temperatures are hot—stretches the life of bearings and withstands years of wear, itself, because there are no extra parts to maintain and replace. Find out about Thermal-Aire Fans—Plug Units, too—with "AIR-COOLED" Shaft for temperatures to 1700°F. or water-cooled shaft for temperatures to 2000°F.

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Check 4918 opposite last page.

NEW SOLUTIONS

Oil stain tests may tell safe storage limit for steel sheets

Test has been devised that makes it possible to produce in one week, oil stains on steel sheet that would take from two months to a year to develop in the field. Experiments are being continued with hopes of developing a sure method for predicting safe storage times for oil-coated steels.

To date, over 60 different oils have been tested with bromine numbers ranging from 0.0 to over 10.

Staining time prediction data should be of great value to steel producers and users alike. Oil stains are a source of trouble whenever cold-rolled sheets are held in field storage. The stain appears as a yellow-discoloration and is difficult to remove or paint over. In most cases, steel that stains has little use.

Test Method

The oil stain test utilizes cold-rolled test panels that have been vapor degreased, scrubbed in hot caustic solution, washed and dried. A drop of oil is applied to one end of panel. Specimens are placed against lower side of a ¼" quartz plate and held in place with spring clip.

In order to maintain definite line of contact between quartz plate, oil, steel panel and air; a piece of light gage nichrome wire is placed between test panel and quartz plate, at opposite end of test panel from oil drop.

Exposed to Ultraviolet Light

Oil on panel is then irradiated with a controlled-intensity beam of violet light. This boosts temperature of steel to about 100°F. At conclusion of ultraviolet exposure period, panels are vapor degreased and inspected.

Length of time for stain to appear and its magnitude can be correlated with severity of oil stain on steel sheets in storage. Also, there seems to be a relationship between staining characteristics and

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PRESSURE?

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*U.S. Patent Nos. 2,833,567 and 2,731,279
"super gem" is an Aeroquip Trademark
Teflon is DuPont's trade name for its tetrafluoroethylene resin

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Check 4919 opposite last page.

MORE QUALITY ENGINEERED FEATURES IN STEPHENS-ADAMSON CARRIERS

Series # 200 Carriers

Series #700 Carrier

35° and 45° Deep Trough Carriers

Pneumatic "Impact" Carriers

ADVANTAGES

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- One-Piece, all-steel, welded frame construction.
- Positive lubrication . . . pre-lubricated at factory . . . provisions for field lubrication.
- Roller brackets tilt two degrees in direction of travel for greater belt training effect.
- Die-cast labyrinth bearing seals keep grease in . . . dust and dirt out.

S-A

WRITE FOR BULLETIN 355

STANDARD PRODUCTS DIVISION
STEPHENS-ADAMSON MFG. CO.
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PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA
CLARKSDALE, MISSISSIPPI • BELLEVILLE, ONTARIO

Check 4920 opposite last page.

degree of chemical unsaturation of the oil.

(Oil stain test was developed by Republic Steel Corporation, 1441 Republic Building, Cleveland 1, Ohio.)

Check 4921 opposite last page.

Ultrasonic level gage improves spent fuel recovery operation

Pinpoints interface level in purification step

Recovery of uranium from spent fuels is being conducted more efficiently in Britain through use of ultrasonic level gages. Close control is essential in purification stage where spent elements are dissolved in nitric acid and contacted with tributyl phosphate in mixer-settler tanks. Separation is effected by settling.

The solvent removes uranyl nitrate from which uranium is later recovered. Phase separation does not take place immediately. Interface at times becomes very ill-defined because of scum formation and sediment.

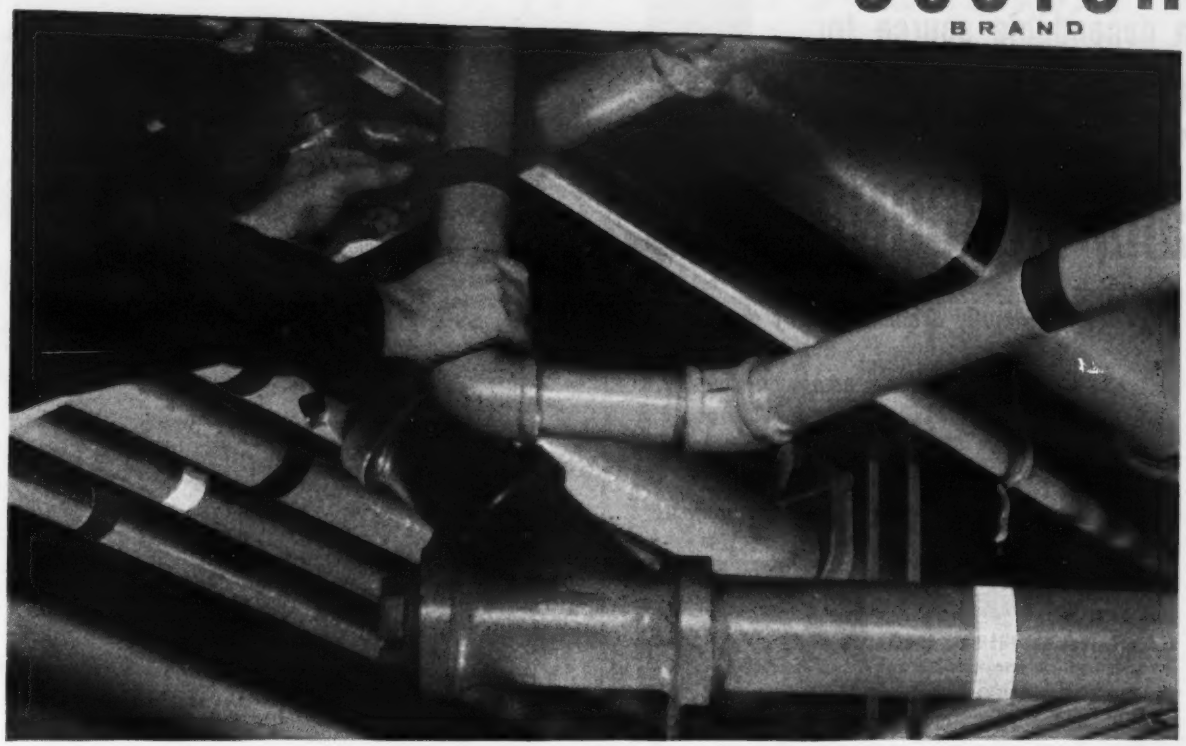
Ultrasonic level gages easily pinpoint interface level. They can also measure depths of mixed phase and determine level of solid substances.

Typical setup is as follows: One or more ultrasonic transducers are used to transmit signals into contents of mixer-settler unit. Reflected signals from contents are picked up and shown as modulations on a cathode ray tube. Entire operation is conducted by remote control. There is no danger of operator being exposed to radioactivity.

If desired, transducer can be transferred from one section of tank to another by system of rails and pulleys. Signals from transversing transducer can then be read on vertical and horizontal time basis to give accurate cross-sectional representation of tank.

(Further information about ultrasonic level gages may be obtained from Patents Exploitation Officer, U. K. Atomic Energy Authority, 11, Charles II Street, London, S.W.1.)

SCOTCH BRAND



TAPEnology... industry's newest cost-cutting tool

TAPE COLOR-CODES PIPELINES FOR EASY TRACING OR SERVICING

See how easily colored "Scotch" Brand Plastic Tape provides at-a-glance identification for pipe and duct systems. Colored bands roll on dry—stick at a touch to any clean, dry surface. Tape is easy to apply even in cramped hard-to-reach areas.

Color coding with "Scotch" Plastic Tape simplifies tracing or servicing of fluid lines, electrical conduit, air ducts, and other in-plant systems. What's more, eight vivid colors—red, green, black, orange, yellow, blue, white, brown—and a variety of widths permit hundreds of code combinations. Won't chip, bake, or flake off. Resists acids, alkalies, greases, salts, and most solvents—lasts for years.

"Scotch" Plastic Tape is also excellent for lane marking and indicating storage zones or restricted areas on floors.

What's your marking problem? Chances are it can be solved with a "Scotch" Brand Tape. Ask your nearest "Scotch" Brand Tape Distributor or write: 3M Company, 900 Bush Avenue, St. Paul 6, Minn., Dept. IAC-100.

When tape costs so little, why take less than "SCOTCH" Brand?

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Dawe's

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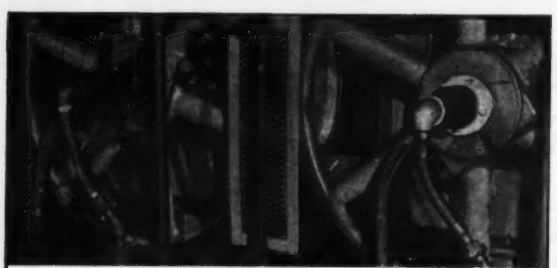

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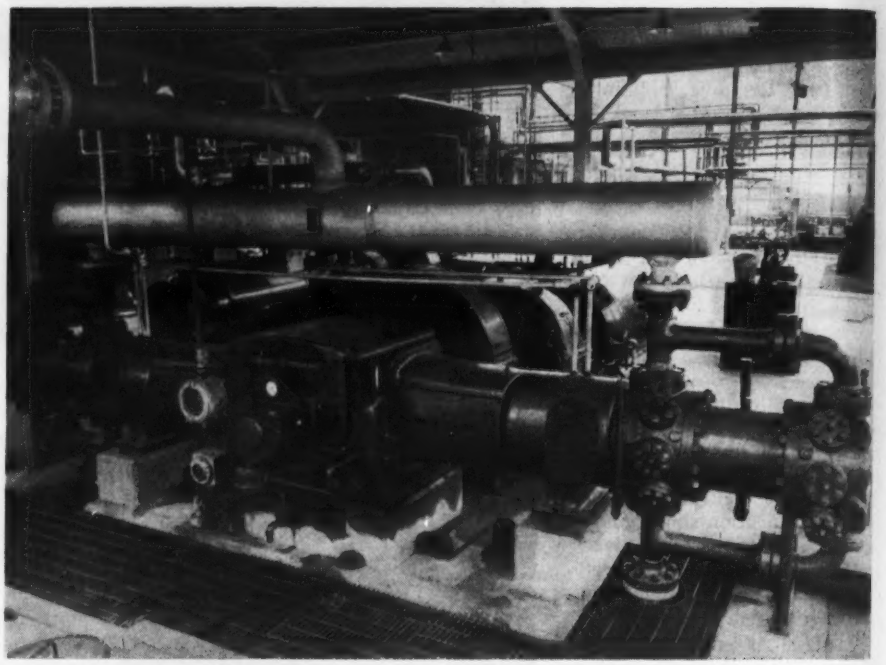
Check 4924 opposite last page.



One of compressors in service at refinery. Balanced-opposed unit has two cylinders

Non-lubricated compressors prevent catalyst contamination

Units used on Platformer have operated with minimum of downtime and maintenance

GORDON WEYERMULLER, Petrochemical Editor
with **A. V. HOFFMAN,** Vice President,
Pennzoil Division,
South Penn Oil Co.,
Oil City, Pa.

PLATINUM catalyst used with Platforming unit at South Penn Oil Company, Rouseville, Pa., would have a very reduced life if contaminated with lubricating oil. Use of compressors with non-lubricated cylinders has prevented this occurrence and helped to protect the catalyst.

The two compressors are used to circulate hydrogen-rich gas through the reactors to control deposition of carbon on the catalyst and also to control the reforming reaction.

At the refinery the two compressors operate in parallel and circulate 30 million std cu ft/day of gas through the reactor system. Gas is about 85% hydrogen. Suction is taken from a liquid separating tank operating at 450 psig and 70-80°F. Discharge pressure is 575 psig at 120°F.

Compressor Design Eliminates Need for Lubricant

Compressors are balanced-opposed, double-acting 7¼ x 7¼ x 12" single-stage units. Each compressor is driven by a 450-hp explosion-proof motor through a gear.

Piston is made of laminated carbon and uses carbon rings, with metal expanders. A hardened-steel, highly polished, dry-type cylinder liner is employed.

Another feature is the use of vented

If you use stainless steel plate

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Company Name_____

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Check 4925 opposite last page.

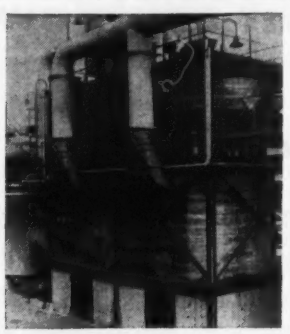
cylinder head packing of carbon rings and stainless steel springs. In area between crank case and tandem, (distance piece) graphite-impregnated asbestos packing is used. Specially treated cylinder valves are employed for the non-lubricated service. Gas passages are constructed so they remain rust-free.

Downtime and Maintenance At a Minimum

Platforming unit went on stream in February 1956 and compressors have operated with little downtime and maintenance since that time. Repairs have been limited to replacement of valve plates and carbon piston rings. Downtime is normally experienced only at the scheduled semi-annual shutdown.

(Type FEO compressors are product of Chicago Pneumatic, 6 East 44th St., New York 17, N.Y.)

Check 4926 opposite last page.



Key equipment . . .

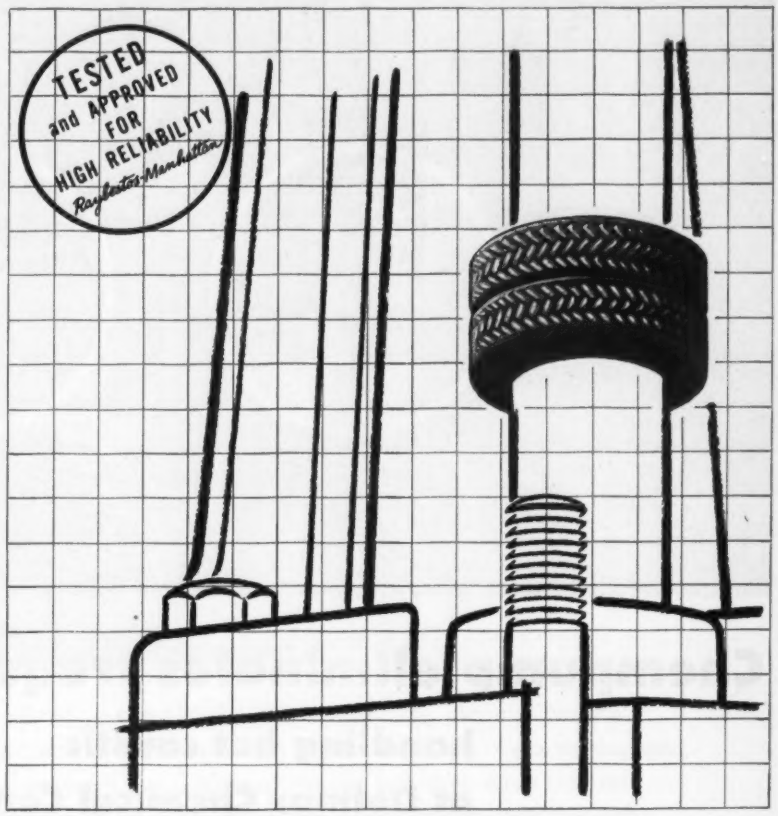
. . . in sulfuric acid plant is this pair of electrostatic precipitators installed at Elizabeth, N. J. works of General Chemical Division, Allied Chemical corporation. Units remove 99% of waste acid mist from scrubber exit gases. Cleaned gas leaves through ducts at top and passes on for further processing.

(Precipitators were designed and built by Metals Products Division, Koppers Company, Inc., 200 Scott St., Baltimore, Maryland.)

Check 4927 opp. last page.

R/M CAPABILITY

takes the guesswork out of high-temperature valve stem packing selection and application

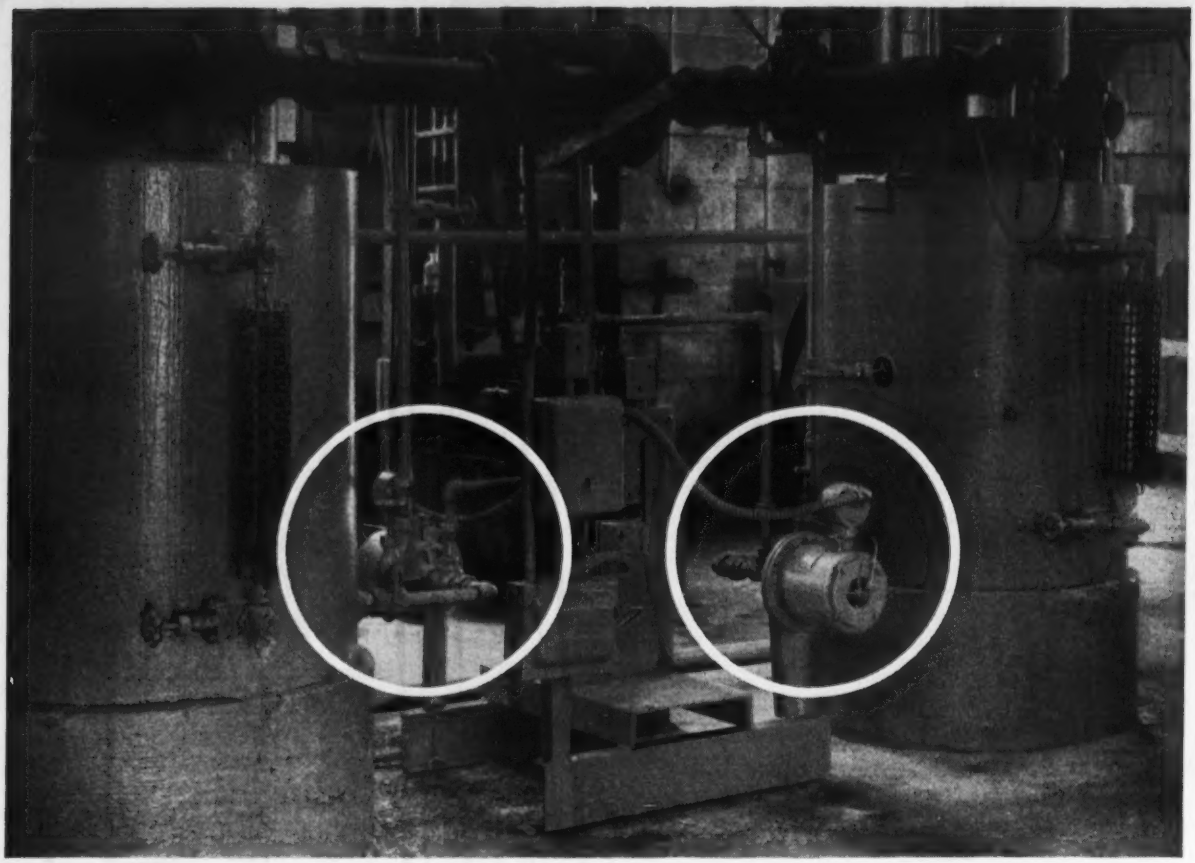


You can depend on R/M High-Temperature Valve Stem Packings to take the *if* out of selection and application. The reasons are simple. Heat resistance is built into the packing. Only high-asbestos-content yarn containing the barest minimum of organic materials required for fabrication is used. A corrosion-resistant inhibitor is compounded into the packing to protect valves after they are hydrostatically tested and stored. Lubrication is ground in during manufacture so that the lubricant stays put and lasts as long as the packing. The braided asbestos jacket assures highest pressure resistance. Where additional strength is required, a Monel wire or Inconel wire asbestos yarn jacket is used. Available with or without surface graphite.

Three kinds of R/M High-Temperature Valve Stem Packings are available . . . R/M No. 303-NM for temperatures to 600°F, R/M No. 303 for temperatures to 900°F, and R/M No. 325 for temperatures over 900°F. For more information about these high-temperature and pressure-resistant packings, write for literature or see your local authorized R/M packing distributor.

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N. J.
MECHANICAL PACKINGS AND GASKET MATERIALS

Check 4928 opposite last page.



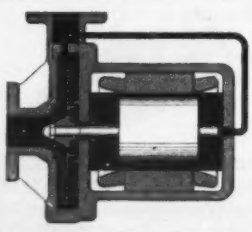
Chempump eliminates frequent shutdowns

handling hot caustic at Delmar Chemical Company

These two *Chempumps* are on the job 24 hours a day, 7 days a week at Delmar Chemical Company, Elkton, Md. They circulate caustic through scrubbing towers for gas purification, and have completely eliminated excessive shutdowns caused by conventional pump stuffing box and seal problems.

These dependable, leakproof pumps are out of operation only for a simple annual replacement of bearings, their only wearing parts. *Chempumps* have no seals, no stuffing box, no packing. No external lubrication is needed, since bearings are constantly lubricated by the pumped fluid itself. Caustic can't leak out and air cannot enter the pump.

Chempump offers many exclusive advantages in any chemical handling application. It would be well worth your while to check them. For details concerning a specific application, write to Chempump Division, Fostoria Corporation, Buck and County Line Rds., Huntingdon Valley, Pa. Engineering representatives in over 30 principal cities in the U.S. and Canada.



Chempump combines pump and motor in a single, leakproof unit. No shaft sealing device required.

U.L. approved. Available in a wide choice of materials and head-capacity ranges for handling fluids at temperatures to 1000 F. and pressures to 5000 psi.

CHEMPUMP®

First in the field...*process proved*

Check 4929 opposite last page.

Polyethylene coatings resist attack from caustic, oxidizers

Polymers contain about 29% chlorine, 1.25% sulfur

Protective coatings formulated with chlorosulfonated polyethylene are reported to be standing up well in large scale field applications. Some have been in use for almost five years and are still going strong.

Although the products are not claimed to be a "cure all" in the battle against corrosion, they do fill a gap in the coating field — especially in those applications involving exposure to caustic and oxidizers. Indications are that the coatings will find increased use in many other severe chemical and atmospheric environments as well.

Coating Preparation

Chlorosulfonated polyethylene polymers are prepared by simultaneous chlorination and chlorosulfonation of polyethylene in solution with gaseous chlorine and sulfur dioxide. Polymers best suited for coating formulations contain about 29% chlorine and 1.25% sulfur (as sulfonyl chloride).

In order to obtain the best properties, it is necessary to follow usual procedures involved in formulating any chemical-resistant coating material. The use of proper pigments, film reinforcing materials and in some cases modifying resins is necessary. Proper solvent balance is also important.

Chlorosulfonated polyethylene is soluble in aromatic chlorinated solvents and some ketones and esters at room temperature. The polymers are very flexible and do not require plasticizers.

Curing or vulcanization is done by use of a polybasic metal oxide or polybasic metal salt of a weak acid, an organic acid and a complex sulfur containing rubber-type accelerator. Curing can also be conducted by use of amine compounds.

Temperatures for curing

must be above 70°F. Force curing at 150° to 200°F boosts chemical resistance and improves physical properties. When properly cured, material has good chemical resistance, withstands weather, ozone and heat, and will not support combustion.

Field Applications

Here are some examples of how chlorosulfonated polyethylene coatings are being used:

At a Wisconsin paper mill, the interior of 18′ diam by 18′ high hydropulper is protected by two 0.010″ coats. Vessel handles pulp slurry containing sizing agents such as alum. Temperature is 120°F, pH is 2. Coating has been in use for over 21 months, shows no sign of failure. Previous coating was vinyl type, failed due to general loss of adhesion within a year.

Tank Cars Coated

Approximately 35 railroad tank cars used for carrying 73% caustic have interiors coated with 0.010″ of a chlorosulfonated polyethylene coating. Loading temperatures range up to 280°F. Only three failures have been reported in 4½ years, attributed to excessive loading temperatures.

(Condensed from technical paper "Protective Coatings Formulated With Chlorosulfonated Polyethylene", by F. J. Ploederl, Wisconsin Protective Coating Corporation.)

(Additional information about chlorosulfonated polyethylene coatings may be obtained from Wisconsin Protective Coating Corporation, 614 Elizabeth Street, Green Bay, Wisconsin.)

Check 4930 opposite last page.

How slurry can be charged into a centrifuge operating at top speed — without crystal degradation occurring — is summarized in two-page folder. Cross-sectional sketch illustrates flow of material through automatic vertical centrifugal. "VS 20 Vertical Centrifugal" — Chemical Machinery Division of Baker Perkins Inc.

Check 4931 opposite last page.

Before scrubber was installed — visible cloud is composed largely of water with about 0.5% sulfur trioxide

THE CHEMICO VENTURI SCRUBBER MAKES THE BIG DIFFERENCE

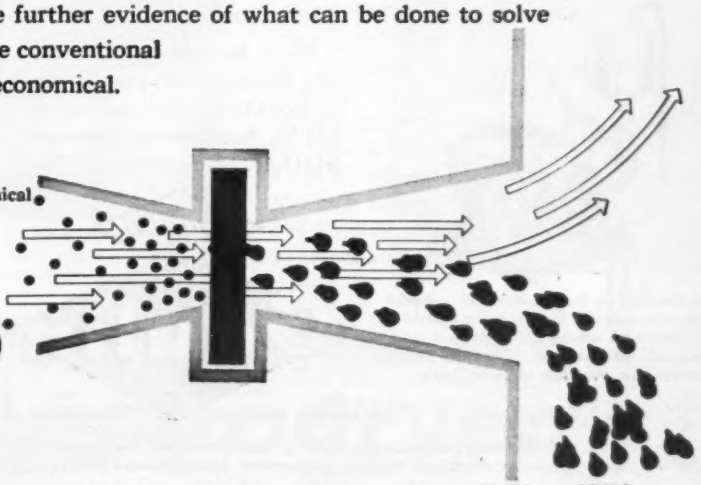
After scrubber was installed — water vapor has diminished considerably, sulfur trioxide content is practically nothing

With sulfur trioxide fumes being vented to the air in a thick vapor fog, Ansul Chemical faced an air pollution problem common to many chemical producers. They were willing and anxious to comply with community requests for pollution control, but they were unable to find a scrubber which could rid the stack of both the water vapor and the SO_3 as well.

While virtually any scrubbing device was capable of removing the water vapor, only the Venturi scrubber was effective in removing the acid fumes. By removing all but the last traces of SO_3 the Venturi scrubber gave further evidence of what can be done to solve really tough gas cleaning problems where conventional cleaning devices prove ineffective or uneconomical.

FULL DETAILS AVAILABLE

For your copy of a brochure giving complete data on Chemico Venturi gas scrubbers, or for technical assistance on a specific problem, write to Chemico at the address below.



CHEMICO

CHEMICAL CONSTRUCTION CORPORATION
Gas Scrubber Division
525 West 43rd Street, New York 36, New York

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Check 4932 opposite last page.

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Now, for a few dollars per day, you can have a laboratory homogenizer in your plant to explore the advantages of Gaulin Particle control on your product . . . to produce superior dispersions, emulsions or blend. No special skills are required to operate the machine. It is quickly and easily disassembled for inspection and cleaning.

Maximum capacity is 15 gph; minimum processable sample — 1 pint; pressures to 8000 psi continuous, 10,000 psi intermittent.

Remember, the rental cost is applicable against the price of the machine.

Write for more information and bulletins on the Gaulin Laboratory Homogenizer LH-55, Sub-Micron Disperser SMD-55, Homogenizers H-55.

Gaulin RE³ Two-Stage colloid Mill — Model 2A — is available for processing quantities as small as 8 ounces, and is invaluable for research, laboratory or pilot plant applications. Also available on rental basis.

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Check 4933 opposite last page.

Air-cooled Exchangers

From page 43

additional cooling load.

Satisfactory operation of the first installation of air cooled exchangers paved the way for a number of additional installations at Linden.

Favorable Experience Removes Skepticism

In 1957 ten twin exchanger units were installed on the Hydrofiner. Subsequently five twin units were installed on the alkylation** unit. A twin unit consists of one tube bundle served by two fans.

In 1959 a total of seven twin units were placed into service on the catalytic cracking unit, the light ends unit, and the ethylene unit. For all air-cooled exchanger installations in this refinery the principal reason for their selection was the comparatively high cost of added salt-water cooling capacity. Data on the Linden air-cooled exchanger installations is shown in the accompanying table.

The maintenance requirements of the air coolers have been low when compared with a salt-water system. Air-cooled exchangers are not burdened with the fouling and corrosion problems associated with salt-water cooling.

Control Problems

Product outlet temperature of an air-cooled heat exchanger can be controlled by varying the fan-blade pitch, by altering air-discharge louvre setting, and by off-on control of individual fans. The Esso installations utilize one or a combination of two of these schemes.

In addition, two of the installations use a water trim cooler in series with the air cooler. A large share of the problems associated with the air-cooled exchanger installations has been the seeking

**To provide maximum accessibility to all equipment, installation of air-cooled heat exchanger atop other equipment was purposefully avoided. The installation at the alkylation unit represents the sole exception. Here water trim coolers are located underneath the air coolers to conserve space and piping

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*"Substantial operations" does not necessarily mean an extremely large plant. But requests for the magazine exceed supply so we must set standards to insure publication being sent where it can be used to best advantage.

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out of a satisfactory control scheme. Esso's experience points out a facet of air-cooled exchanger operation which warrants careful attention.

(Air coolers on Powerformer, Hydrofiner, alkylation, and catalytic cracking units were furnished by Hudson Engineering Corporation, 5900 Hillcroft Ave., P. O. Box 3218, Braeburn Station, Houston 36, Texas.)

Check 4935 opposite last page.

(Air coolers on light ends and ethylene Units were furnished by Griscom-Russell Co., Massillon, Ohio.)

Check 4936 opposite last page.

Protect reinforcing steel in concrete by adding emulsified asphalt

No sign of corrosion after 12 years in sea water

Results of recent tests indicate that concrete and reinforcing steel in concrete can be protected against salt water deterioration by an emulsified asphalt compound. Known as Hydropel, 1½ gal of the material was used per sack of cement.

In the tests, several specimens were completely submerged in San Francisco Bay. Others were placed in a tidal zone to provide periodic wetting and drying. The salt content of the Bay water averages 3%.

Periodic tests and examinations were made over the 12 year period of exposure. Major findings were: 1) Steel reinforcing rods showed no signs of corrosion; 2) Modulus of rupture of concrete was almost twice that of plain concrete; and 3) Compressive strength increased for both plain and Hydropel concrete, but differential remained about 25% less for the treated concrete.

(Further information about Hydropel may be obtained from American Bitumuls & Asphalt Company, 320 Market Street, San Francisco, California.)

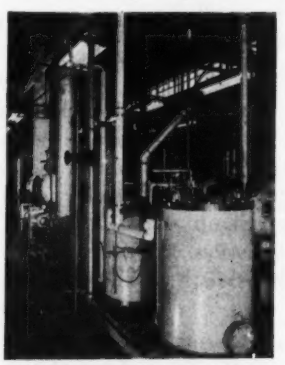
Check 4937 opposite last page.

At Caterpillar Tractor Co. . . .

4 new Lectrodryers boost supply of controlled atmosphere to 60,000 cfh

Heat treating furnaces at Caterpillar Tractor Co., Peoria, Illinois, draw on a central source of controlled atmosphere gases for annealing, brazing, carburizing and other metallurgical operations. Five Lectrodryers are now drying 30,000 cubic feet of gas per hour; four more Lectrodryers are being added to almost double the capacity.

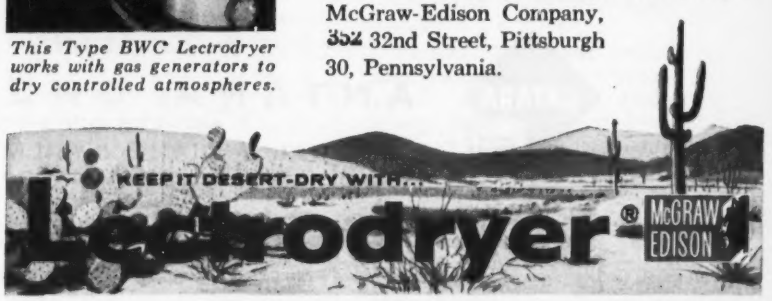
Manifolding the output of several gas generating units gives the flexibility required to service Caterpillar's many controlled atmosphere furnaces. Where those atmospheres must be dry, Lectrodryers lower dewpoints to −20°F.



This Type BWC Lectrodryer works with gas generators to dry controlled atmospheres.

Your gas generator builder

can advise you on equipment for supplying controlled atmospheres. Where dry gas is required, he'll quite likely supply Lectrodryers. *For data sheets* on metallurgical gas drying installations, or for answers on any other drying problems, write Pittsburgh Lectrodryer Division, McGraw-Edison Company, 352 32nd Street, Pittsburgh 30, Pennsylvania.



Check 4938 opposite last page.

V23 10 OCT 60 XUM

What does it take to win first place? Usually, a lot! And Alipal anionic surfactants offer a lot to liquid detergents: good cleansing power, high wetting strength, easy emulsification, economical price – all in combination with high foaming ability. Alipal formulations are also distinguished by easy rinsing and improved drainage characteristics, mildness of odor and gentleness to the skin.

Alipal CO-433 is employed especially in industrial applications requiring stability to alkali. It is useful as an emulsifier for latex polymerizations and petroleum waxes, as a wetting agent in the processing of textiles and of metals, an antistatic agent for plastic materials, and in other operations.

Alipal CO-436 is used principally in detergents for dishes and light laundry, and in household cleaners for rugs and hard, waxed surfaces. Also in bubble baths and hair shampoos.

Chemists must be able to rely on the complete standardization and purity of the components they use – and they can when the label reads "Antara"! Purchasing Departments, too, find Antara's product line attractive because it is so broad. You get extra convenience and economy when you supply all of your chemical needs from a single source. Shipments are made promptly from distribution points located nationally – by tank car, tank truck, drum or even smaller containers. Write or call any Antara office for samples, information, and technical assistance.

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Alipal anionic surfactants manufactured by General Aniline & Film Corp. are sold outside the U.S., by distributors all over the world, under the trademark "Fenopon."

Check 4939 opposite last page.

NEW SOLUTIONS

Plastic fan saves $$$ exhausting corrosives from chemical plant

Previous unit scraped after only 18 months service

Problem: Corrosive fumes were raising havoc with ventilating fan at large midwestern chemical company. Impeller, bearings and shaft had to be overhauled and replaced after

Corrosion-resistant fan has heavy-duty bearings designed for tough continuous service

eight months service. Fan broke down completely after only 18 months, having accumulated more than $1100 in repairs and lost production costs.

Solution: An exhaust fan constructed of solid unplasticized PVC was installed. Unit has heavy-duty oversize bearings designed for continuous service. Fan can operate well below critical speed.

Results: The PVC fan is satisfactorily exhausting the corrosive fumes. Estimates are that unit may save more than $4500 in repairs and maintenance (in addition to savings in uninterrupted production) during the next ten years.

(Rigivin No. 20 plastic fan is product of Heil Process Equipment Corp., 12901 Elmwood Avenue, Cleveland 11, Ohio.)

Check 4940 opposite last page.

Automatic, continuous process for making hypochlorite bleach liquor at Crown Zellerbach Corporation is reviewed in two-page technical reprint. The system uses oxidation-reduction potential of liquor to control chlorination reaction. Reprint 3320—Dorr-Oliver Inc.

Check 4941 opposite last page.

*keep your eye on epoxidation — part 2**

Epoxides boast 'strength-plus', high UV resistance

Epoxidized plasticizers stemming from Carbide's acetaldehyde-to-peracetic-acid route open door to new PVC applications

By JOHN MELLECKER

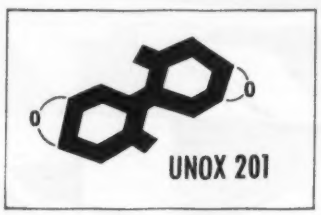
Synthetic-resin diepoxide monomers designed like structural trusses. Epoxidized plasticizers for polyvinyl chloride that will make outdoor uses of vinyls practical. Epoxidation of new configurations by a unique reagent produced by an exclusive process. These are the first in a series of epoxy events that have already made Union Carbide Chemicals a leading contender in the burgeoning epoxy field.

Called "Unox," UCC's three new epoxy monomers feature these general characteristics:

- High strength qualities, particularly at elevated temperatures, due to stubby, compact ring structures which cross-link into a tight mass.
- Low viscosity — of two of the new epoxides. Makes handling, use easy. Attractive diluents for conventional epoxides.
- High resistance to sunlight (ultraviolet), due to saturation of rings . . . conventional epoxides have benzene rings, are subject to discoloration, deterioration.
- High reactivity — use lower-cost hardeners, cross-link faster. One new product an excellent chemical intermediate.

No Side Chains, Rings Saturated

Unox 201 is a totally new composition of matter, discovered in Carbide's labs. Its structure is in some ways similar to the "conventional" widely used glycidyl ether (G-ether) epoxide, as commonly produced from bisphenol-A.



. . . sunlight resistance

Improvements included elimination of side chains, making the epoxy groups integral parts of the pair of rings, saturating the rings.

Economical. At 67¢/lb, 201 is finding wide uses in varnishes, other surface coatings. It is being used as finish coat over conventional epoxide primers (which can't stand ultraviolet).

In varnish manufacture, 201 reacts with the fatty acid at 180°F in ½ hr instead of the 225-260°F for 4-5 hr required by the "conventional" G-ether.

201 is attractive for electrical encapsulation because of long pot life and stable coefficient of thermal expansion in the important temperature range of room to 200°C.

Heat-distortion temperature (HDT) qualities are outstanding, too. While the conventional epoxy (from G-ether) produces resins rated at 264°F, 201 can be "hardened" to produce epoxies in excess of 450°F. With a wide selection of hardeners, HDT's of 300°F can be easily obtained.

More Like Metal

Unox 207 is highest in strength of the group, resulting from interlocked, internally-reinforced ring architecture. Resins made from 207 have already found wide acceptance in glass-reinforced fabrication. When filled with atomized aluminum powder, 207 resin castings resemble metal more than plastics, are used for making gears!

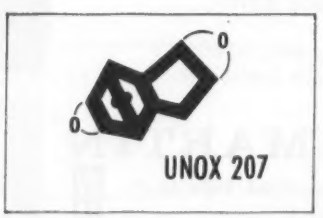
Glass laminates made from resins formulated from Unox 207 show flexural strengths as high as 74,700 at room temperature, which drops only to 47,100 at 500°F!

Bodies for truck-trailers, truck cabs and transportation vans, plus piping and tanks, as well as missile and aircraft components, are some of the uses envisioned for the present.

Eventually, Carbide executives envision 207 becoming a new building material for the construction industry.

Price for the time being is 92.5¢.

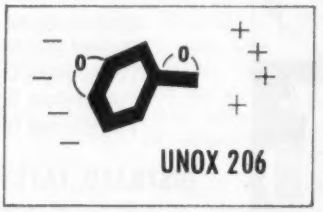
A white solid melting at 363°F, 207 has the convenient property of ready solubility in near stoichiometric quantities of certain anhydride-type hardeners, such as maleic anhydride.



. . . more like a metal

'Unbalanced' Reactivity

Unox 206 is outstanding for several reasons, one being low viscosity, which is almost that of water. It is being effectively used as a reactive diluent for the more viscous conventional G-ether epoxies, without reducing their temperature properties.



. . . viscosity like water

Perhaps 206's most important property is its "unbalanced" reactivity. One epoxy group (part of the ring) is more reactive under acidic conditions. The other (part of the side chain) is more reactive to basic conditions. As opposites attract, it is easily possible to make the monomer react with itself, producing three-dimension polymers.

Most exciting use so far for

*See July 1960 CP, page 28, for earlier sum-up of epoxidation routes, products and applications.

MODERN CHEMICALS OF PREFERRED QUALITY

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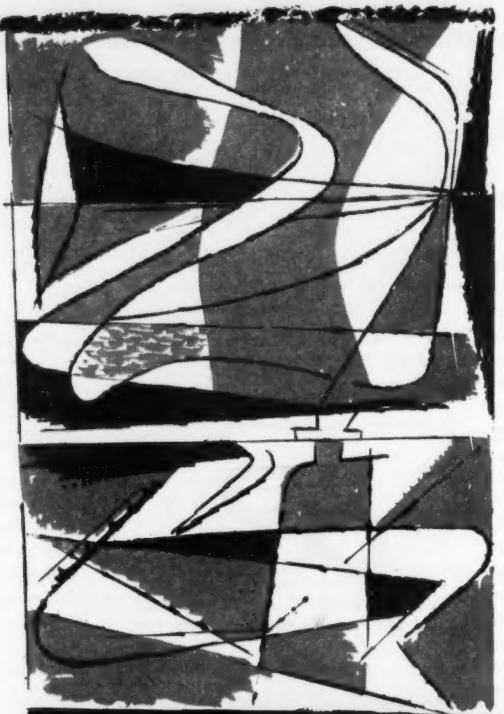
NITROGEN DERIVATIVES—CATIONICS

The "Wilimids" are a series of surface active agents which exhibit strong cationic and germicidal activity.

- esters of other fatty acids, different alcohols or glycols also available.



WILSON-MARTIN

Snyder Avenue & Swanson Street, Phila. 48, Pa.

Div. of WILSON & CO., Inc.

Check 4942 opposite last page.

206 is its reaction with cotton cloth (hydroxyls of cellulose) to impart crease-resistance — "Wash-and-Wear" — properties. Advantage of the "Uset Textile Resin 11-74" over other crease-resistance treatments — which contain nitrogen — is its insensitivity to bleaching chlorine — which turns the normally treated cotton fabrics yellow.

Also important is that a flame-retardance plastic can be made with 206 by hardening with chlorendic anhydride.

Chemical reactivity of 206 makes it an interesting intermediate, particularly for polyglycols syntheses. When hydrogenated it yields cycloaliphatic diol. Hydrolysis yields tetrol.

Streamlined Marketing

UC's Chemicals Co. is marketing the three Unox compounds as monomer systems — comparable to selling styrene monomer. The buyer does the polymerizing using materials of his choice, tailoring the operation to the exact needs of final application.

Richard Joslin, UC Chemical's director of new products marketing, comments, "We know the introduction of such improved, specialized resin monomers is a prescription business. For the time being, we're quite content to help the laminators, extruders, impregnators, casters, etc. develop their own resin systems. Later on, it is entirely possible that we will offer polymerized intermediates having obvious economic advantages to our customers."

Already, Schenectady Varnish Co. and Brunswick Corp. have made major applications advances using Unox monomers.

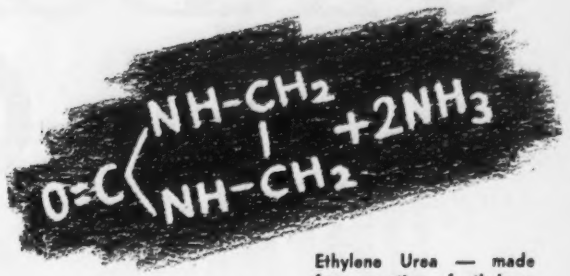
UCC technical service staff services such mid-use customers, as well as their application customers, as necessary.

"One advantage of this system," continues Joslin, "is that the UCC technical service men, functioning on an industry basis, can serve in the interests of several UCC products. For example, in the textile industry, tech service men

To page 73

Ethylene Amines: hard workers for textile and paper industries

Reaction products of versatile chemical family also carving niche in coatings and adhesives field



Ethylene Urea — made from reaction of ethylene-diamine and urea

Ethylene amines are versatile compounds and useful as intermediates in the preparation of a broad line of end products. Although first prepared in 1871, the first practical applications were discovered in 1933. However, large commercial demands were not created until some time later.

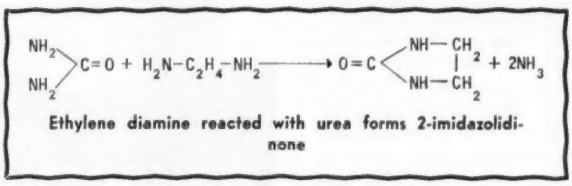
Growing competition of synthetic fabrics brought about the need to impart equivalent properties in cotton — especially wrinkle resistance and drip-dry characteristics. The upsurge of the ethylene amines and their reaction products started in the early fifties due to a demand for textiles with similar properties. Volume increased to such an extent that Dow built its second plant in 1957.

Other markets for the reaction products of ethylene amines exist in the paper, agricultural, coatings and adhesives, petroleum refining fields and as chelating agents. Fastest growing use among these is in the pulp and paper industry.

Currently the largest single use for resins made from the ethylene amines is in the textile field.

Still another application is the use of the reaction product as a curing agent for epoxies. This is only a small portion of the total market, but due to the continuing interest in this field a good growth rate is expected.

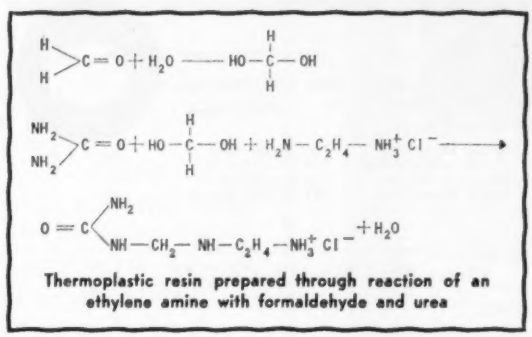
Ethylene amines are slightly viscous, water-soluble liquids having a strong ammoniacal odor. Chemically they resemble ammonia, being basic substances which give alkaline reactions in aqueous solution and form salts with acids. Salts, in contrast to parent amines, are odorless, nonvolatile solids insoluble in organic solvents.



Ethylene diamine reacted with urea forms 2-imidazolidinone

Ethylene Diamine Reactions

Ethylene diamine will react with urea, diethyl carbonate, carbon dioxide or phosgene to give 2-imidazolidinone (ethylene urea). The one in common use is the reaction with urea. Other reactions have found no potential commercial use.

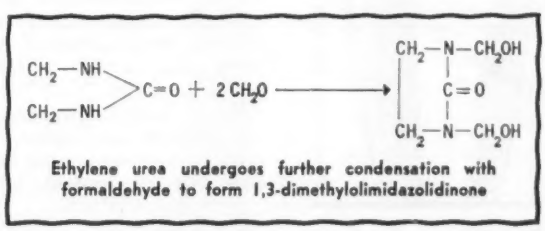


Thermoplastic resin prepared through reaction of an ethylene amine with formaldehyde and urea

Ethylene urea will undergo further condensation with formaldehyde to form 1,3-dimethylolimidazolidinone.

Textile Applications

Ethylene amines and their reaction products find many uses in the textile industry. In addition to the wrinkle resistance and water repellency properties, which have been given the greatest amount of attention, there are others. Other uses in the textile field: detergents, surface-active agents, chelating agents, and finishing agents to improve dye-ability, dye-fastness, tensile strength, elongation.



Ethylene urea undergoes further condensation with formaldehyde to form 1,3-dimethylolimidazolidinone

Paper Industry Applications

Same type ethylene amine reaction products utilized in the textile industry may also be applied in the paper industry. Can be used as wet-strength resins, sizing agents and ingredients of adhesive compositions.

Wet strength is greatly increased by adding to beater stock the thermoplastic resin prepared through the reaction of an ethylene amine with formaldehyde and urea.

Condensation is carried out under mild acid conditions. The amine joins with the urea through a methylene group furnished by the formaldehyde.

Incorporation of the ethylene amine forms a cationic resin containing polar groups usually amino and imino in structure. In the above example, ethylene diamine has been used as the example. In practice, the higher homologs are used extensively, i.e. diethylene triamine, triethylene

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Check 4944 opposite last page.

tetraamine and higher.

Other reaction products, such as the imidazolidones, likewise have utility as wet-strength resins, as do modified melamine-formaldehyde materials. The latter type products have an advantage in that they need not be aged before being added to the beater stock. Cationic nature of certain of the wet-strength resins results in an almost complete pick-up of the resin by the paper, thus eliminating to a great degree the loss of resin in the white water.

Cationic-active anchoring agents useful for bonding water and fire-proofing materials, pigments and filler to wood pulp, cotton linters and similar fibrous materials are prepared by reacting ethylene amines with aliphatic carboxylic acids. For bonding dry-strength resins, the reaction product of an ethylene amine and an aliphatic dihalide or halohydrin or urea-formaldehyde derivative thereof is employed.

Ester gum and higher fatty acid condensation products prepared from ethylene amines have demonstrated their utility as cationic sizing agents. Paper is sized by adding the resin to the beater stock and heating the paper formed to a temperature of 105-150°C for ½ to 4 min. Treated paper is thus water repellent and cationically active.

Coatings and Adhesives Applications

Further use for the variety of ethylene amine reaction products is found in the coatings and adhesives field which to a degree is comparable to the textile and paper industries.

Marked thixotropic properties can be achieved when the ethylene amines are reacted under carefully controlled conditions with dimerized or trimerized unsaturated fatty acids in the presence of glyceride oils, varnish esters or similar vehicles.

Resins may be prepared by the reaction of amines with fatty acid — containing materials such as vegetable oils —

To page 68

CRYOGENICS

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Check 4945 opposite last page.

THAT'S INTERESTING

Permanent creases

Chemical treatment developed by U.S. Department of Agriculture scientists makes it possible to crease or pleat wool fabrics permanently.

A 0.5 to 2.0% solution of ethanolamine in water is used, with a very small amount of detergent to facilitate wetting. It can be applied by either spraying or dipping after which the fabric is steam-pressed.

Treatment is applicable to fabrics that have been shrink-proofed by epoxy-polyamide resins.

Businesses' rise and fall

A total of 420,000 businesses were launched between first quarter 1959 and comparable period in 1960. During same period a total of 345,000 failed or were merged with other businesses.

For more information on product at right, specify 4946 see information request blank opposite last page.

Which of these 3 products and services can you use from BECCO?

What's new in Metal Treatments and Etching?

Quite a few things. For example, there's the use of Becco Ammonium Persulfate in etching printed circuits. Seems the material works a lot better – at less cost – and with none of the hazards of the ferric chloride solutions conventionally used.

Then, there's the problem of pickling copper and brass. Lots of pickling agents will do this – only trouble is, you've got to paint or plate or do whatever you're going to do with the metal rather quickly. Or else. Or else it will tarnish or oxidize and you're in the pickle all over again.

Not so with Ammonium Persulfate. Cleans fine. Puts a mild etch on the surface, too, for better paint or plating bonding. More important, perhaps, is the fact that the metal resists retarnishing for up to two weeks. Ideas?

We hope so. What's more, we've got several booklets to help spur you on. They're free—use the coupon below to order.

No. 39 and 51—Surface Treatment of Metals with Peroxygen Compounds.

No. 86 – Improving Properties of Copper and Brass Surfaces.

No. 97 – Paddle Etching of Printed Circuits with Ammonium Persulfate.

No. 99 – Tank Immersion Etching of Printed Circuits with Ammonium Persulfate.

No. 102—Etching of Printed Circuits with Mercury Activated Persulfate.

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☐ 97 ☐ 102 ☐ 99

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What's a PEROXYGEN?

Fact is, "peroxygen" is a word that Becco uses to indicate that we can tie oxygen onto just about anything.

How come? Well, years of experience in producing Hydrogen Peroxide has produced an affinity between Becco and oxygen — an affinity we have capitalized on to give you compounds that will provide a ready source of oxygen — wherever, however and whenever you need it.

We have a good number of such compounds on the shelves. Quite a few others are in development. Still others are merely in our minds, but we can begin drawing them out if you're interested.

We hope you are interested. But we'll never know—unless you fill in the coupon below and mail it to us. Why not?

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Can you use this free Becco help, based on more years of experience with bulk handling of H_2O_2 than any other manufacturer? Use the coupon to let us know.

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Gentlemen:
Please tell me more about your Four-Fold Engineering Service.

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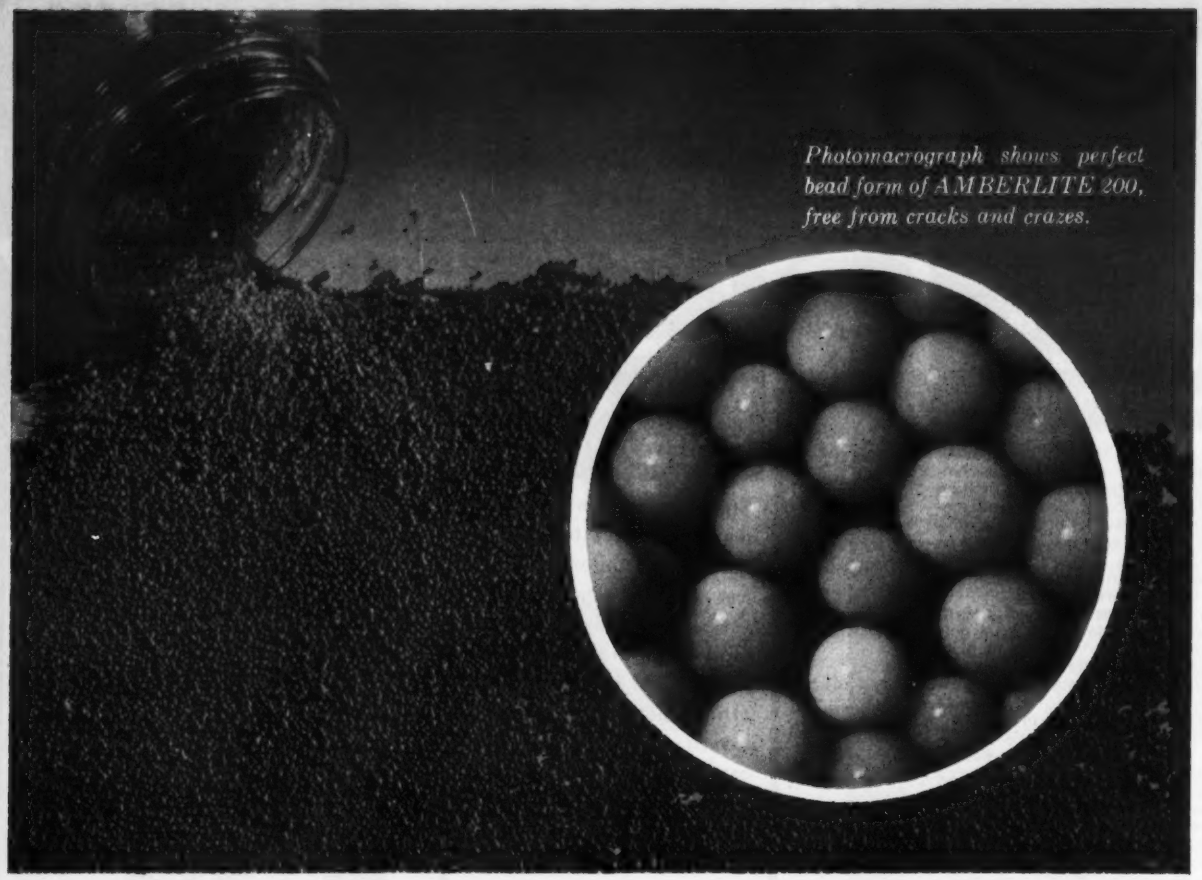


Photomacrograph shows perfect bead form of AMBERLITE 200, free from cracks and crazes.

AMBERLITE 200

Introducing new durability for Ion Exchange Resins

AMBERLITE 200 represents an entirely new concept in polymer chemistry. A high capacity, strongly acidic cation exchange resin, AMBERLITE 200 has physical and chemical stability unmatched by any available cation exchange resin.

These are some of the outstanding features of AMBERLITE 200 . . . *high resistance to oxidation,* especially in water containing chlorine, oxygen and metals such as iron, copper and manganese; *perfect bead form,* free of cracks and crazes; *high attrition resistance; stability over the entire pH range; insolubility in all common solvents.*

In addition to water treatment in either hydrogen or sodium cycle operation AMBERLITE 200 has unusual value in the treatment of highly concentrated solutions such as sucrose and glucose, where resin dehydration causes rapid failure of conventional exchangers. Resistance to oxidation makes AMBERLITE 200 useful in treatment of highly aggressive solutions such as chromic acid or where high operating temperatures are involved.

Write for full information and samples on this radically new AMBERLITE resin.

AMBERLITE *is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.*

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Check 4947 opposite last page.

Ethylene Amines

From page 66

or with vinyl chloride resins. Products obtained by the first route are hard, thermoplastic, heat-resistant, transparent resins. Those obtained from the vinyl chloride resins are flexible at low temperatures and have a high tensile strength and elongation even at relatively high temperatures.

(Ethylene amines are a product of The Dow Chemical Company, Midland, Michigan.)

Check 4948 opposite last page.

More cleaning, foaming provided by alkylate of higher mw

Increased foaming action cuts production costs

Uses: As heavy-duty detergent raw material.

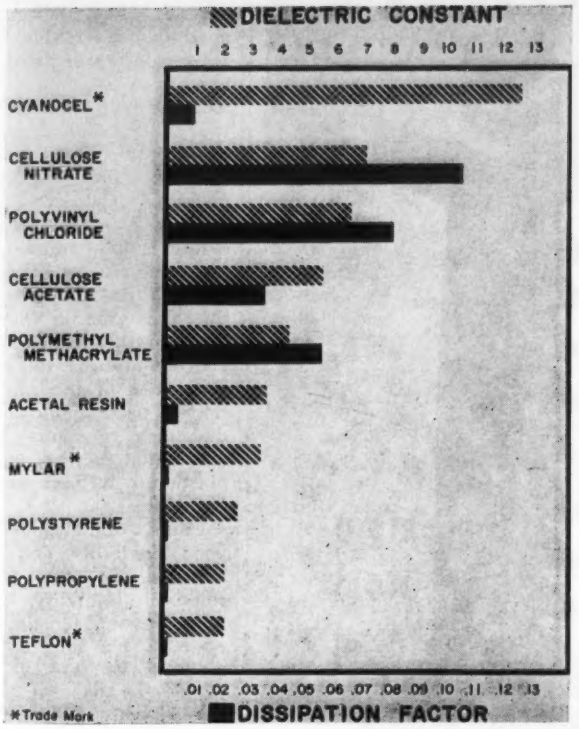
Features: Increased molecular weight, average carbone side chain is made up of 13 carbon atoms, boosts detergent's foaming and cleaning power when compared to detergents made from conventional dodecyl benzene products. Balanced molecular distribution gives maximum heavy-duty detergent performance over major range of water hardness.

Description: Detergent alkylate, Alkane "60", has an average molecular weight of 267 and Saybolt color of +30. Good color and a bromine number of 0.03 indicate absence of unsaturated impurities.

Increased foaming of detergents manufactured from this alkylate minimize need for costly suds boosters usually added to heavy-duty detergents. This should result in a savings in production costs. No new equipment or modification of standard detergent production techniques are required.

(Alkane "60" is a product of Oronite Chemical Company, 200 Bush Street, San Francisco, California.)

Check 4949 opposite last page.



Dielectric constants and dissipation factors for organic film-forming materials. Values were obtained at 60 cycles, 110 volts AC

Organic film former tops field with 10-15 dielectric constant

Made by cyanoethylating pure fibrous cellulose with acrylonitrile; can be cast, molded

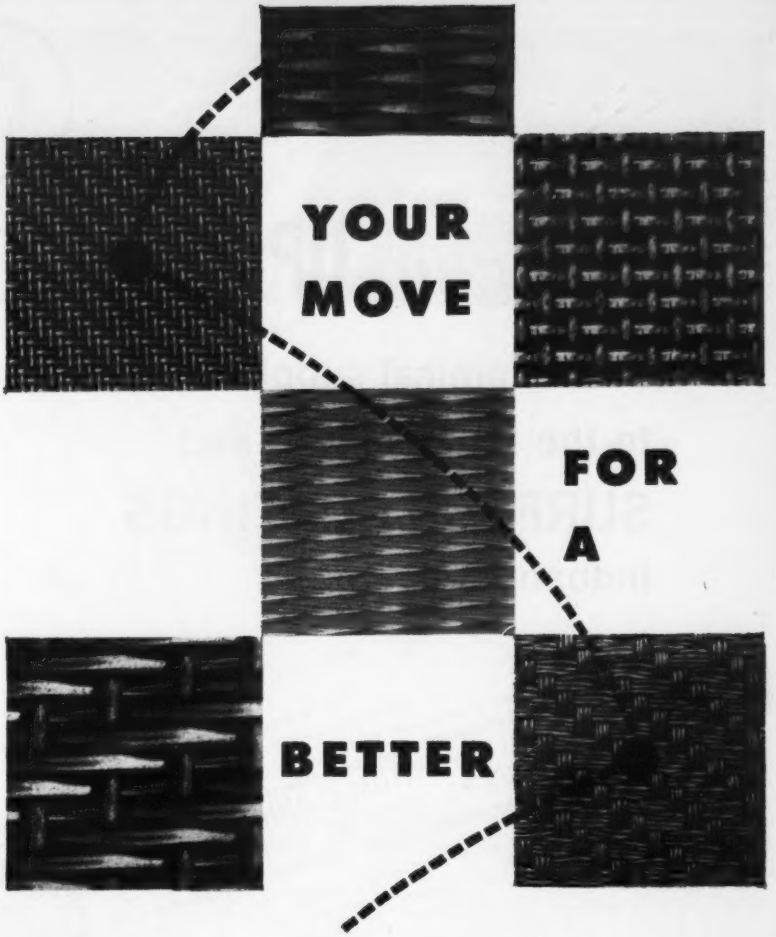
Uses: Chemically modified cellulose is a film-forming dielectric. First commercial application will be in an electroluminescent lamp made by General Electric Company.

This most recent cyanoethylated cellulose product can be cast as a clear, transparent film as thin as 0.1 mil or as thick as 5 mils or more. It can also be molded at high temperature and pressure. Molded articles, under dry conditions, have a dielectric constant similar to that of the films.

Features: At a frequency of 60 cycles, cast films show a dielectric constant of 10 to 15, and a dissipation factor of 0.010 to 0.025. Kraft paper, currently used to separate and insulate electrodes, has a dielectric constant on the order of 5 to 6. Even when used together with a liquid dielectric the combination has a dielectric constant only slightly higher than that of paper alone.

Product's dielectric constant (in range of 10 to 15) is the highest among organic film-forming materials now available.

Description: Cyanocel is made by treating a purified



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FOREIGN AFFILIATE • California Chemical International, Inc., San Francisco, Geneva, Panama

6722

Check 4951 opposite last page.

form of fibrous cellulose with acrylonitrile. It is supplied as a white fibrous solid or as a 10% solution. American Cyanamid has been able to chemically modify 2.6 to 2.8 of the three available hydroxyl groups on each gluocosidic unit of cellulose with a cyanoethyl group.

Films have been cast from solutions in a number of organic solvents or solvent mixtures. Physical properties of the films can be changed by incorporating plasticizers. To prevent altering the electrical properties of the films, plasticizers used should have high dielectric constants and low dissipation factors. A suitable plasticizer is bis(cyanoethyl)-phthalate.

Films of Cyanocel have good flexibility and physical strength. At 23°C and 50% relative humidity, two-mil films have a tensile strength of 5380 psi and a Young's modulus of 0.34 x 10^6 psi. Films can be cast onto any flat, smooth surface, such as glass or metal foil.

(Cyanocel is a product of American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N.Y.)

Check 4952 opposite last page.

Vinyl takes 60°F higher operating temperature than conventional

Uses: Applications predicted for this vinyl plastic include pipe and fittings, shaped ducting, molded products such as camera cases and household appliances, and for such automotive parts as glove compartments, hoods and rear decks.

Features: Long-term testing has shown that this vinyl will stand up under 200°F . . . 60° higher than is possible with conventional rigid vinyls. Pipe made from this material can handle pressures as high as 100 to 160 psi at 180°F, and several times this at normal temperatures.

Vinyl retains all of the qualities of strength, lightweight, impact resistance, nonflammability and corrosion re-

Weighted strips of various plastics are immersed in 180°F water bath. Strips are (from right to left) conventional vinyl, high-density polyethylene, polyamide and recently introduced high-temperature vinyl

sistance that have made resin second-largest selling plastic class in the world.

Description: Material has been designated a polyvinyl dichloride called hi-temp Geon. It will not support combustion and is rated as "self-extinguishing" by ASTM tests. Thermal conductivity is low.

Pipe made from this resin can be joined with socket solvent cement joints or threaded couplings. It can be cut with an ordinary saw and formed to desired curvatures by heating. Product has received approval of the National Sanitation Foundation for carrying potable water.

(High-temp Geon is the product of B. F. Goodrich Chemical Company, Div. of B. F. Goodrich Company, 800 Second Ave., New York 17, N.Y.)

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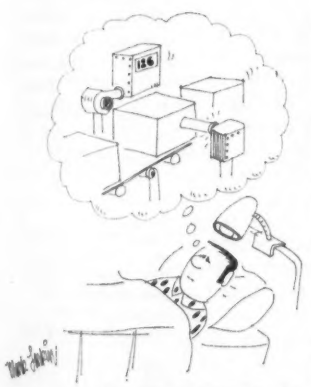
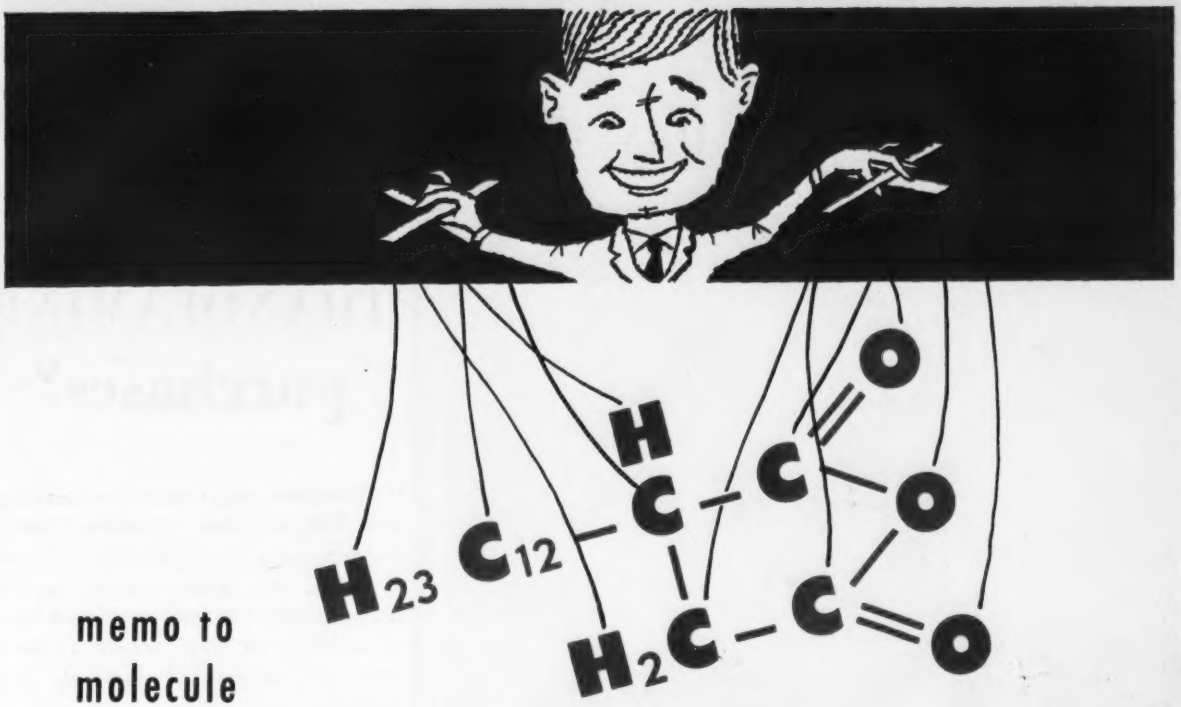


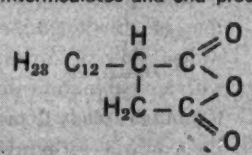
Mark Larkin, Electra Mfg. Co.



memo to molecule manipulators

about . . . National® DODECENYLSUCCINIC ANHYDRIDE

Here is a long-chain bifunctional alkenylsuccinic anhydride with an interesting configuration on which to build new intermediates and end products.



Note particularly the three points for addition reactions as steps toward new end products. Note also the positions of the oil-soluble alkenyl group and the hydrophilic reactive anhydride end.

DODECENYLSUCCINIC ANHYDRIDE finds use as an epoxy curing agent, polyester and alkyd resin intermediate, corrosion inhibitor, etc. Many other uses are cited in the literature.

DODECENYLSUCCINIC ANHYDRIDE is one of a long line of dibasic acid anhydrides produced by National from basic raw materials wholly integrated within the Allied Chemical group. It is amply available in commercial quantities.

WRITE FOR TECHNICAL BULLETIN I-8.
This six-page technical bulletin gives chemical and physical properties, principal reactions, infra-red absorption spectrogram, viscosity curve, suggested uses and a bibliography. A copy of this bulletin and a liberal working sample will be sent on request. Our Development Chemists will be glad to provide additional assistance to those whose work may lead to volume use of National Dodecenylsuccinic Anhydride.

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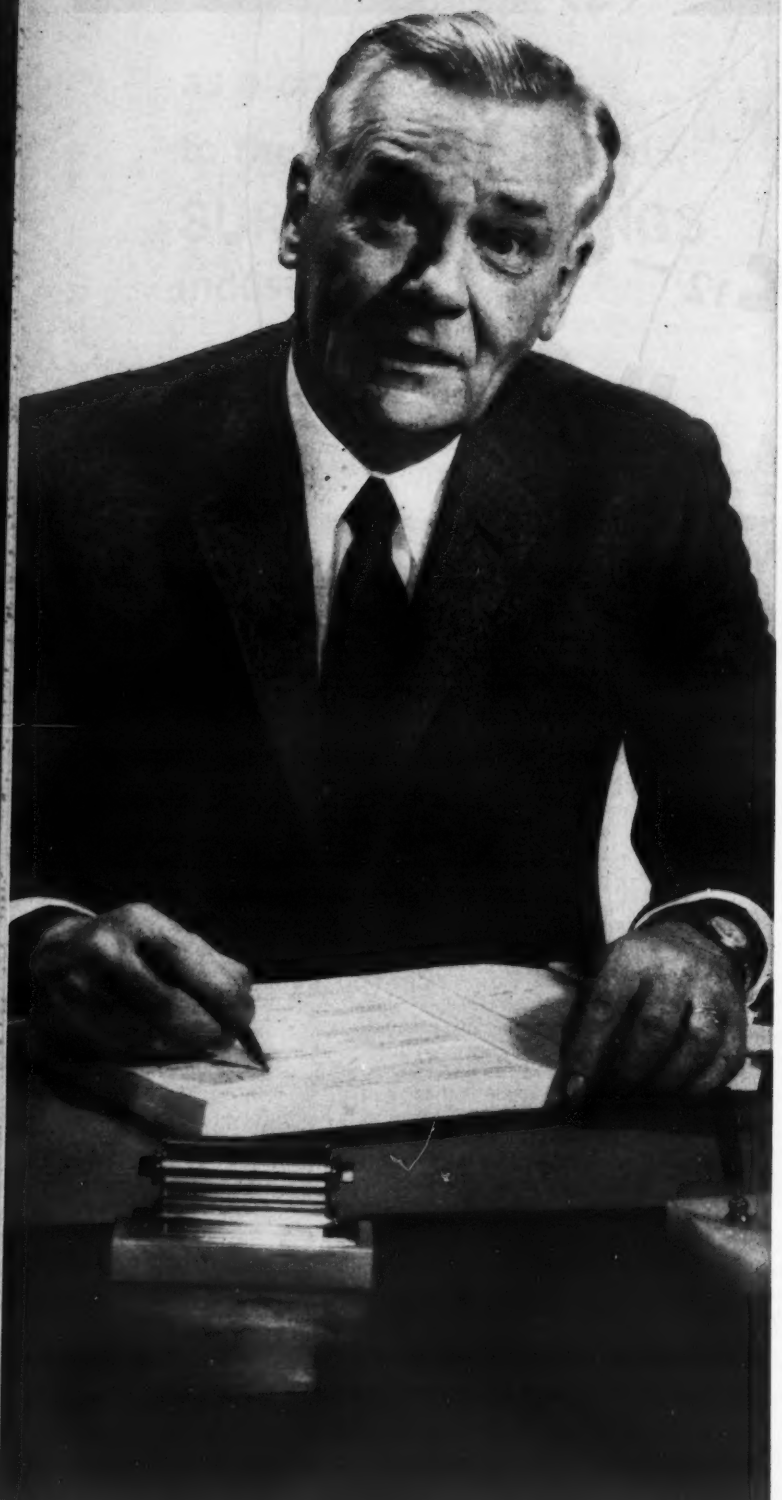
Allied Chemical

Check 4954 opposite last page.



Why pay a $1,280 premium on your ETHANOLAMINES purchases?

It's the differential that makes the difference. Ethanolamines cost *more* per pound in drums—*less* in compartment tank cars or trucks. Most manufacturers can take advantage of the money-saving bulk price by ordering all their organic chemical needs in combination shipments from CARBIDE.

A 4,000-gallon-capacity tank car can be made up of two chemicals in compartments, with a savings of 4 cents on every pound of the average chemical. The total average savings is $1,280—$1,280 that can be added to profits or applied to greater production. Three-compartmented tank cars hold 6,000 gallons, and the greater capacity means bigger savings.

Put these CARBIDE money-saving advantages to work on your production line—by simply switching from LCL to economy-size orders.

Since CARBIDE has the industry's widest line of ethanolamines—as well as the widest line of organics, supplying you with a combination shipment is easy. And CARBIDE is ready to make deliveries across the country—wherever you are located.

For specific information on savings—tank cars *vs.* drums—call your nearest CARBIDE Technical Representative. Or write: Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

PROBLEMS?

Interested in solving them? Want to learn new ways of improving your plant operation and, thereby, realize savings

In each . . .

issue of CHEMICAL PROCESSING there are articles that will help you solve many of your operational problems.

These "New Solution" stories appear in the "New Solutions" section which begins on page 44 of this issue.

This type of story is featured in other sections throughout the magazine.

They are case history stories that state the operating problem, explain how it was solved, and describe the results obtained.

"New Solution" stories cover all important phases of your operations — processing, safety, maintenance, material handling, packaging, corrosion, to name a few.

For more information on product at left, specify 4955 see information request blank opposite last page.

New Epoxy Uses

From page 64

working on Ucet treatment of cotton cloth, will also be handling Polyox warp size for weaving of cotton cloth. Such economy is important when you're sending out your most experienced technologists to help sell products."

Better Plasticizers Too

Monomers are not the only new products.

New epoxidized plasticizers for PVC offer that industry intriguing opportunity for new applications for its plastic.

New epoxidized plasticizer Flexol 163-D has the unusual quality of imparting fungus resistance to PVC plastics, while at the same time functioning as a primary plasticizer for PVC resin because its compatibility is superior to the workhorse plasticizer-stabilizer now in widespread use, epoxidized soybean oil.

163-D now promises to make practical outdoor use of vinyl tile and furniture upholstery as well as agricultural use of PVC film and sheeting. Vinyl coatings with 163-D will withstand exposure on aluminum house siding, industrial coatings applications, and as linings for ponds and swimming pools.

Until recently a development product, 163-D is now available in commercial quantities.

Conventional soybean plasticizers are improved, too. Flexol-EPO is of this type, but features higher oxirane oxygen (epoxy group) content, lower residual unsaturation than previously known epoxidized soybean oils. Commercial importance of this type of product is that EPO is used for almost all PVC resin produced in making the plastic.

Another newcomer, Flexol JPO, has good performance properties at lower cost.

Extension of low-temperature flexibility properties of PVC plastics at lower cost can be accomplished by another plasticizer, EP-8, an epoxidized tallate ester of 2-ethyl hexanol. It can be used in place of the more expensive and non-epoxy azelates, adipates, and sebacates. EP-8 is also blended with the soybean oil types to improve their low-temperature flexibility properties, when intermediate levels are satisfactory.

Pure Peracetic Paves Way

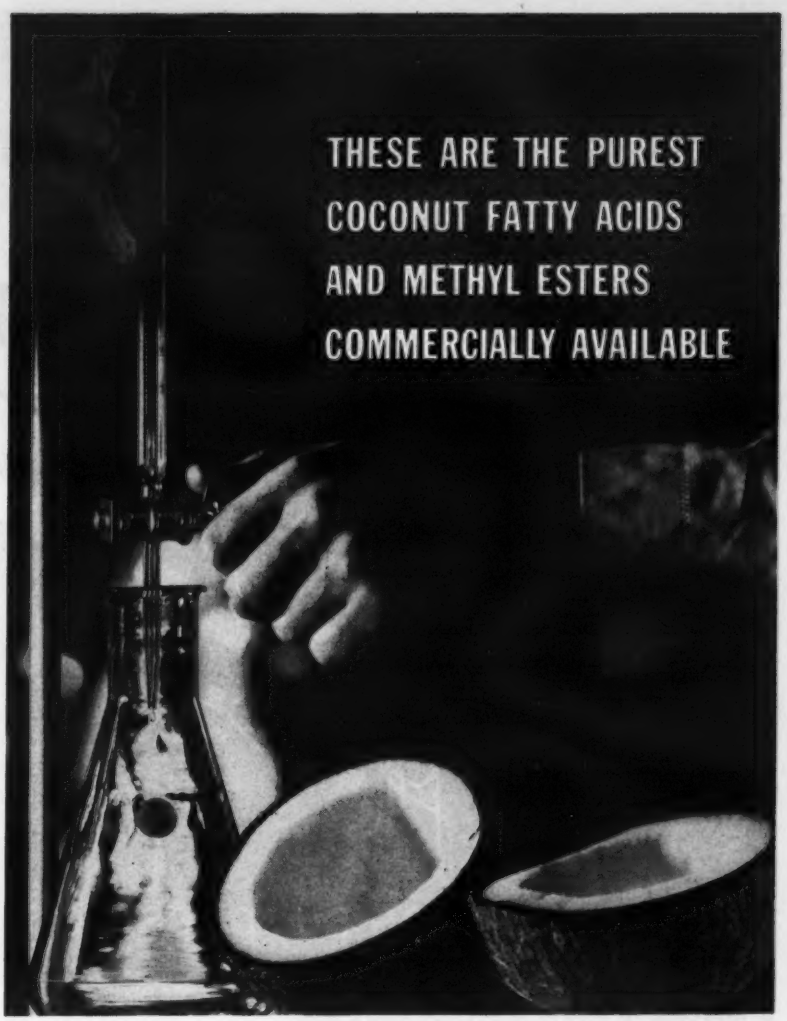
UC Chemical's manufacturing and marketing drive into exciting new epoxy resin monomers and the EPO and EP-8 plasticizers stems from the company's success at commercializing a radically different process for making peracetic acid — used by Carbide as its epoxidizing agent.

Most others epoxidize by an *in situ* process (see July 1960 CP, page 28). There, acetic acid is converted into peracetic acid in the reaction mass, which includes the fatty acid, butadiene derivative, or other material being epoxidized.

Carbide's peracetic acid, made by an exclusive process from acetaldehyde, is free of acetic acid, hydrogen peroxide, salts, and water—all of which are present with peracetic acid in the *in situ* process.

Carbide claims they can accomplish epoxidation reaction results with their high-purity peracetic that are impossible with a less pure material. The implication is strong that the particular molecular configurations chosen for the Unox line, as well as EPO and EP-8 plasticizers, are feasible because of the reactivity of the new high-purity peracetic.

Unfortunately, the high-purity peracetic is not a commodity to be shipped in commercial quantities, according to Carbide executives. This limits its use to facilities adjacent to the UCC peracetic plant at Institute, W. Va. In addition to epoxidizing large quantities of soybean oil as well as the butadiene and cyclopentadiene derivatives entering into the making of Unox resin monomers, UCC is interested in custom epoxidizing materials for its customers. "These must be in quantities



At Foremost-El Dorado, where we concentrate on manufacturing coconut fatty acids and methyl esters exclusively — purity is foremost. We produce the purest commercially available. For example, our Lauric and Myristic acids and esters are over 98% pure. More important, these high standards of purity are constantly uniform. Reason why hundreds of companies from coast to coast have been depending on Foremost-El Dorado shipments for over 65 years. We ship to your requirements — in drums, bags, and in tank cars. Also mixed compartment tank cars of acids and esters. Supplies near you to meet your deadline.

If you have any unusual requirements, let our representatives work with you. For the Foremost-El Dorado Agent in your area, write, wire or phone: Department CP-1060

COCONUT FATTY ACIDS		COCONUT METHYL ESTERS	
Caprylic	*Palmitic*	*Caproate*	*Palmitate*
Capric	*Cocoleic*	*Caprylate*	*Oleate*
Lauric	*Eldhyco**	*Caprate*	*Eldo* 18*
Myristic	*Coconut*	*Laurate*	*Coconate*
		Myristate	

*T. M. Reg.

Foremost EL DORADO

FOREMOST FOOD AND CHEMICAL COMPANY

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Check 4956 opposite last page.

of several hundreds of thousands of annual pounds to be commercially attractive," says Dick Joslin.

Intriguing Process

The process for making Carbide's pure peracetic is an outstanding example of modern American chemical engineering and chemistry skills. It represents an excursion into a highly sophisticated, dangers-harnessed type of processing operation in which precise control over residence time and momentary temperature of reaction products is critical.

Basically, the process diffuses oxygen at low temperature (below 15°C) into acetaldehyde which is converted to an ordinarily treacherous addition product, acetaldehyde monoperacetate. If it is allowed to warm up to room temperature, a vigorous, even explosive reaction results. If controlled by cooling, acetic acid is formed.

UCC has discovered a unique process by which the acetaldehyde monoperacetate is "cracked" at high (perhaps as high as 250°C) temperature.

The vapor mixture, if allowed to cool, would permit reaction of peracetic acid with the other vapor constituent, acetaldehyde.

UCC's other important discovery was a way to quickly condense out the peracetic moments after the cracking operation, allowing the acetaldehyde vapor to pass out of the system to be condensed elsewhere.

More to Come

With such a potent new tool as its pure peracetic acid, UCC can be expected to be readying other new epoxides — a fact confirmed by Carbide executives.

(More information on these epoxy monomers and epoxidized plasticizers can be obtained from Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York.)

Check 4958 opposite last page.

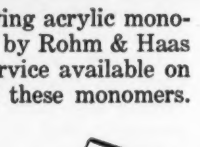
A message to acrylic monomer users who would like:

- **Monomers at lower delivered cost**
- **Flexibility in multiple monomer orders**
- **Reduced inventories**
- **Simplified paper work in ordering**

Rohm & Haas—the only commercial producer of both acrylates and methacrylates—gives you these benefits by offering delivery in compartmented tankcars and tanktrucks. If you fill a tankcar or tanktruck with a combined shipment of two or three monomers, you pay the economical bulk price for each monomer. Savings such as this also apply to mixed truckloads and carloads of monomers in drums.

Request information today on (1) the convenience and savings made possible by buying acrylic monomers from the broad range offered by Rohm & Haas and (2) the complete technical service available on the bulk storage and handling of these monomers.

Write to Dept. SP-7 for samples, and technical literature on acrylic and methacrylic acids and esters.



Chemicals for Industry

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Acrylic Monomers available commercially from Rohm & Haas...

METHYL ACRYLATE · ETHYL ACRYLATE · BUTYL ACRYLATE · 2-ETHYLHEXYL ACRYLATE METHYL METHACRYLATE · ETHYL METHACRYLATE · BUTYL METHACRYLATE · HEXYL METHACRYLATE · DECYL-OCTYL METHACRYLATE · LAURYL METHACRYLATE · STEARYL METHACRYLATE · GLACIAL ACRYLIC ACID · GLACIAL METHACRYLIC ACID

Check 4957 opposite last page.

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★

Coal Tar Naphthalene Is Purified Economically by Continuous Sodium Process

A semi-continuous, commercial process for desulfurizing coal tar naphthalene, through treatment with metallic sodium, has been developed by U.S.I. specialists in sodium chemistry. This development provides coke oven producers with an efficient and economical method for purifying naphthalene to the levels demanded by makers of phthalic anhydride, dyes, vinyl plastics, moth balls and other naphthalene products.

78° Naphthalene can be treated with 1.5% by weight of sodium for reduction of sulfur content from about 0.5% to less than 0.05%, at a cost of under one half a cent per pound. Naphthalene recovery would exceed 99%. Capital investment for a plant to treat 50-60 million lb./yr. of naphthalene would be about $50,000.

In such a semi-continuous plant naphthalene—with residual phenols removed through pretreatment with solid caustic for best sodium efficiency—is fed into a series of kettles and contacted with sodium for 30-60 minutes. The naphthalene is then flash distilled from the residue. The residue, upon decomposition with steam, yields crude napthalene, low in sulfur, which would be returned to the head of the process.

Bulk sodium is metered directly into the treating kettles. With adequate agitation, sodium will emulsify quickly and

MORE

New Trona Mining Method Planned in Intermountain's Soda Ash Plant Expansion

Intermountain Chemical Co., a 10% owned affiliate of U.S.I., has announced plans for a $4,000,000 expansion of their soda ash facilities, to be completed in 1962. Capacity is being increased from 520,000 to 720,000 tons per year.

The company mines trona ore in the Green River area of southwestern Wyoming and refines the ore into soda ash. A new method for mining trona, developed by Intermountain, will be tried for the first time as part of the expansion. It is a continuous system for mining, extraction and movement of trona which eliminates blasting and drilling underground. The method uses augers, adapted from hard-coal mining.

During expansion, Intermountain will also make changes in refinery technology.

Final Regulations on Tax-Free And SD Alcohols Now in Effect

A&TTD Issues New Simplified & Liberalized "User" Regulations

The Alcohol and Tobacco Tax Division of Internal Revenue published final revised regulations (effective July 1) on the distribution and use of Specially Denatured and Tax-Free Alcohols in the Federal Register of June 29. These regulations provide for administration of the Internal Revenue Code of 1954 as amended by the Excise Tax Technical Changes Act of 1958.

For the first time, the A&TTD has separated "user" regulations from others covering production of ethyl alcohol and specially denatured formulations. Here is a brief summary of some of the important provisions of the new "user" regulations. For details, see Industry Circulars 60-22 on SDA and 60-21 on Tax-Free.

(1) **Industrial Use Permits**—Forms 1481 (SDA) and 1447 (Tax-Free)—no longer have to be renewed annually. They remain in effect unless suspended, revoked, surrendered or otherwise terminated.

(2) **Withdrawal Permits:**
Form 1485 (SDA)—permits expire Oct. 31 each year. Renewal application must be filed annually by July 10, Effective Nov. 1, 1961, permits will allow monthly withdrawal of 1/6 of annual allowance (formerly 1/12).
Form 1450 (Tax-Free)—permits expire Apr. 30 each year. Renewal application must be filed annually by Jan. 10. Effective May 1, 1961 (earlier with special permission), permits will allow monthly withdrawal of 1/6 of annual allowance (formerly 1/12).

(3) **Losses**—on SDA, the minimum quantity on which a claim for re-

MORE

New Polyethylene Bag with No-Leak Closure Shows Promise as Sterile Pack

A new, low-cost, sterile polyethylene bag with a wire tape closure is now being used by the dairy industry for milk sampling and reportedly finding application in a number of fields, including cosmetics. The containers are made of clear, heavy polyethylene tubing, sealed both top and bottom to keep the inside sterile.

A line of perforations is provided for removing the sealed top. Below the perforations are two wire tapes which help in opening and form the closure for the bag. For resealing, tapes are pulled taut, top of bag is rolled down, and projecting ends of tapes are bent over. A liquid-tight closure is formed. The three photos below show unsealing, opening and resealing.

New polyethylene bag is sterile-sealed until perforated top is zipped off.

Bag is snapped open by pressing in on wire tapes around top opening.

Liquid-tight resealing is done by rolling bag top down, and folding tape ends over.

★ U.S.I. CHEMICAL NEWS ★

CONTINUED *Alcohols*

mission of tax must be filed has been increased to 5 wine gallons. On Tax-Free, the minimum quantity has been increased to 5 proof gallons.

(4) **Reports:**
Form 1482 (SDA)—submitted annually instead of monthly for users who withdraw less than 660 gal./yr. Those who withdraw more must still report monthly, unless otherwise authorized.
Form 1451 (Tax-Free)—submitted annually instead of monthly.

(5) **Samples**—SDA samples of one quart may be obtained without permit.

(6) **Samples of Labels and Advertising** for articles not containing SDA, but made from SDA, no longer required by A&TTD except on request.

(7) **Carrier Permits**—no longer required.

(8) **Proprietary Solvents**—may be packaged by *distributors and users* as well as manufacturers, provided the packages are properly marked.

(9) **Return**—Consent of Surety for return will no longer be required of SDA permittees, but will be required in blanket form from person to whom returned.

Many other points are also covered in detail in Industry Circulars 60-22 and 60-21. It can be seen that the A&TTD has made the new regulations more liberal, and has simplified the paper work involved in the use of SDA and Tax-Free Alcohols.

CONTINUED *Naphthalene*

react. It is not necessary to use predispersed sodium, since crude naphthalene contains many naturally occurring trace impurities which are excellent dispersing aids for sodium.

For further information, send for the new U.S.I. technical data bulletin "Desulfurization of Naphthalene by Sodium". Address Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., N.Y. 16, N.Y.

New Polyethylene Resins Produce Squeeze Bottles Of Excellent Appearance

U.S.I. has developed three new PETROTHENE® polyethylene resins with properties particularly suited to the blow molding of bottles for drugs, cosmetics and chemical specialties. Two of the resins can also be used for injection molding. All have been successfully field tested. Each of the resins produces bottles of outstanding appearance, good stress crack resistance and excellent low temperature flexibility.

PETROTHENE 101 and PETROTHENE 102-2 can be used in both blow molding and injection molding. The first has high stiffness, which permits reduction in wall thickness and, consequently, lower cost per container. The second has high impermeability to liquids, oils and gases, and a high flow rate which is particularly useful in blow molding pieces 6 to 20 oz. or heavier. PETROTHENE 209-2 is designed for use only in blow molding, especially for relatively small moldings—under 10 oz. —with thick side walls.

Data sheets on these three new resins are available from U.S.I. Address Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., New York 16, N. Y.

First heat exchanger successfully fabricated from zirconium is part of unit to concentrate H_2O_2 solutions. Zirconium's corrosion resistance in this application made it profitable to overcome welding problems associated with the metal. (Photo courtesy The Pfaudler Co.)

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

High molecular weight synthetic polypeptides now commercially available include glutamic acid, γ-benzyl glutamate, lysine hydrobromide, ε-carbobenzoxylysine, o-carbobenzoxytyrosine, leucine, alanine, phenylalamine, tyrocine. **No. 1630**

New booklet on industrial hazards—casualty, fire, pollution and product liability—discusses measurement, detection, correction and litigation. Stresses prevention, and need for help of experts when mishaps occur. **No. 1631**

Borax and other boron compounds are described in new brochure which can now be obtained. Contents include historical data; production, uses, properties of commercial boron compounds; properties of 28 research chemicals. **No. 1632**

Kit for emergency radioactivity decontamination is now on market. Provides radioisotope users and laboratories with respirator, disposable clothing, decontamination solutions, instruction manual—all in steel case. **No. 1633**

Acetone specifications, properties, shipping methods and uses are listed in new data sheet now available. Material is widely used as solvent, and in making drugs, dyes, plastics and many other organics. **No. 1634**

New polyethylene drum faucet is said to empty 55-gallon drum of average material in about two minutes. Fits standard 2-inch drum outlet. Comes with polyethylene spout closure to eliminate residual dripping. **No. 1635**

Hair care is covered in new book now being sold. Said to be most complete ever written for layman on growth, care, diseases and treatment of hair disorders. **No. 1636**

Non-electric magnets have been installed under belts of conveyors on aerosol filling lines to hold cans in place during underwater travel to heating bath. Magnetic units said to be available in lengths to fit any conveyor belt. **No. 1637**

The rare earths plus thorium, scandium and yttrium—chemicals, metals, alloys—are detailed in new booklet. Gives uses, potentials, production, properties, chemical analyses for over 50 products. **No. 1638**

New, versatile, bench model superspeed centrifuge with built-in safety shield, accommodating 5 interchangeable rotors for batch or continuous flow separations, is on market. Rotors are fitted with removable polyethylene liners. **No. 1639**

PRODUCTS OF U.S.I.

Ethyl Alcohol: Pure and all denatured formulas; Anhydrous and Regular Proprietary Denatured Alcohol Solvents SOLOX®, FILMEX®, ANSOL®M, ANSOL PR

Organic Solvents and Intermediates: Normal Butyl Alcohol, Amyl Alcohol, Fusel Oil, Ethyl Acetate, Normal Butyl Acetate, Diethyl Carbonate, DIATOL®, Diethyl Oxalate, Ethyl Ether, Acetone, Acetoacetanilide, Acetoacet-Ortho-Chloranilide, Acetoacet-Ortho-Toluidide, Ethyl Acetoacetate, Ethyl Benzoylacetate, Ethyl Chloroformate, Ethylene, Ethyl Sodium Oxalacetate, Sodium Ethylate, Urethan U.S.P. (Ethyl Carbamate), Riboflavin U.S.P.

Pharmaceutical Products: DL-Methonine, N-Acetyl-DL-Methonine, Urethan USP, Intermediates.

Heavy Chemicals: Anhydrous Ammonia, Ammonium Nitrate, Nitric Acid, Nitrogen Fertilizer Solutions, Phosphatic Fertilizer Solution, Sulfuric Acid, Caustic Soda, Chlorine, Metallic Sodium, Sodium Peroxide.

PETROTHENE®...Polyethylene Resins

MICROTHENE ... Finely Divided Polyethylene Resin.

Animal Feed Products: DL-Methionine, MOREA® Premix (to authorized mixer-distributors).

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Solvent uses seen for eutectic liquid urethane mixture

Uses: Liquid is suggested as solvent for recrystallization, polymer processing, paints, lacquers and as a coupling agent and paint stripper.

Features: Solvent is particularly useful for raw materials for high molecular weight carbamates and polymers. It is miscible with water and most organic liquids with the exception of saturated aliphatic hydrocarbons.

Description: Liquithane is a eutectic liquid mixture of ethyl and methyl urethanes. It is a colorless, practically odorless liquid consisting of approximately 52% ethyl urethane and 48% methyl urethane. Boiling point is 90°C at 20 mm. Equilibrium melting point is 13-17°C.

(Liquithane is available from Millmaster Chemical Corporation, 99 Park Avenue, New York 16, New York.)

Check 4959 opposite last page.

NEW LITERATURE
Chemical Materials

Tetramethyl-1, 3-cyclobutanedione and its reduction products, 2, 2, 4, 4-tetramethyl-1, 3-cyclobutanediol are highlighted in 21-page brochure which presents a combined total of 23 different syntheses in detail. Methods for saturated polyester and alkyd formulation are also presented. Bul TDR N-110—Eastman Chemical Products, Inc., Subsidiary of Eastman Kodak Company.

Check 4960 opposite last page.

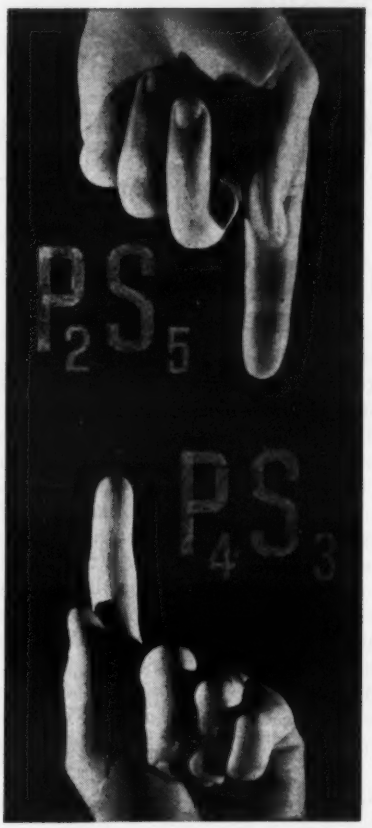
"Asphalt, Tar and Pitch" booklet suggests a number of interesting ways in which these ancient raw materials may be incorporated into modern products—Client Relations Department, Foster D. Snell, Inc.

Check 4961 opposite last page.

For more information on product at left, specify 4962 . . . see information request blank opposite last page.

BRIEFS

phosphorus sulfides
sulfuryl chloride
muriatic acid



HOOKER OFFERS TWO OF THE FOUR

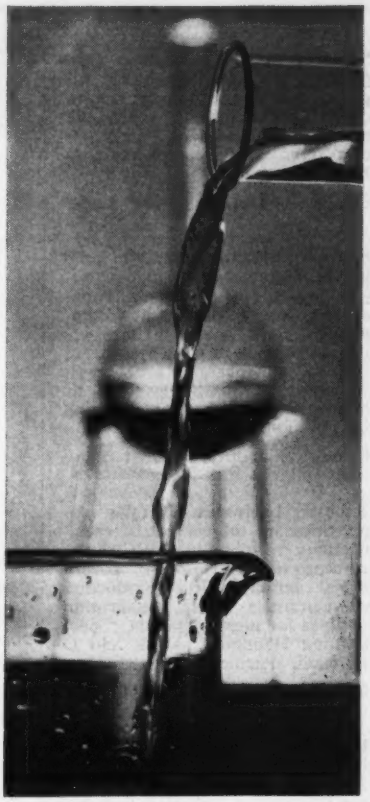
According to the Encyclopedia of Chemical Technology, only four of the 14 phosphorus-sulfur compositions are true chemical entities. We offer two of them: phosphorus sesquisulfide (P_4S_3) and phosphorus pentasulfide (P_2S_5). Both have wide use as reagents in organic synthesis. We provide the pentasulfide as a grey-yellow material fused solid or as a powder in three mesh sizes. It has a typical melting point of 278°C. Our phosphorus sesquisulfide is a lemon-yellow powder with a typical melting point of 171°C. It contains no free phosphorus. Write for complete data sheets on both.

WHAT THEY SAID IN 1944

A technical paper in the September, 1944 issue of *Industrial and Engineering Chemistry* predicted great things for a relative newcomer on the reagent scene, Hooker sulfuryl chloride. It said:

"Sulfuryl chloride is a versatile reagent with great potentialities in organic synthesis. Under appropriate conditions it may be used for the chlorination and sulfonation of both aliphatic and aromatic derivatives. It may also be applied as an acylating and condensing agent. The simplicity of these reactions, their ease of control and their high yields promise to make the reagent particularly useful in many applications which require simple and unspecialized equipment."

What was said in 1944 is just as true today. For a reprint of this comprehensive technical article and our technical data sheet, check coupon below.



BETTER ADSORPTION WITH HCL

Now they're activating clay with muriatic acid instead of the cheaper sulfuric acid. Reason: 25% to 75% higher decolorizing efficiency of the resulting clays. Chloride salts produced in the digestion step are more soluble than sulfates produced by H_2SO_4. The new process is a boon to lube oil producers, vegetable oil refiners and manufacturers of catalysts. Our authority for this is *Chemical Engineering,* January 12, 1959, page 62.

Since Hooker is a major producer of muriatic acid, we look with great favor on any new process that involves substantial tonnages of this product. We produce two grades, commercial and Hooker white, both arsenic-free and of exceptional purity. Our data sheet No. 720-B will be sent on request.

For more information, check here and mail with name, title and company address:

- ☐ Phosphorus pentasulfide, data sheet
- ☐ Phosphorus sesquisulfide, data sheet
- ☐ Muriatic acid, data sheet
- ☐ Sulfuryl chloride, reprint and data sheet

HOOKER CHEMICAL CORPORATION
510 Forty-seventh Street, Niagara Falls, New York

Sales Offices: Buffalo Chicago Detroit Los Angeles New York Niagara Falls Philadelphia Tacoma Worcester, Mass.
In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

HOOKER CHEMICALS PLASTICS

Check 4963 opposite last page.

"Emulsifying, Thickening, Suspending and Stabilizing with Algin" is subject of four-page technical bulletin. A table compares the effectiveness of various algin products for specific applications—Kelco Company.

Check 4964 opposite last page.

Silicone dielectric used in pole line insulators and bushings is subject of four-page brochure. Time-delay photographs show how compound isolates contaminating particles from each other so that leakage paths cannot form, even when weather is foggy, wet or humid. Bul 4-218—Dow Corning Corporation.

Check 4965 opposite last page.

Tubular laminated fiberglas capabilities are the subject of specifications handbook which shows current technical limits, advantages, terminologies, production characteristics and specification outlines for these materials. "Specification Handbook" — R and D Division, Pacific Laminates, Inc.

Check 4966 opposite last page.

Halogenated hydrocarbons as blowing agents for rigid urethane foams are described in two product information bulletins. Included are sample foam formulation, foam photomicrographs and application pictures. "Genetron Blowing Agents"—General Chemical Division, Allied Chemical Corporation.

Check 4967 opposite last page.

"Chemical Products From Corn" is title of four-page folder which presents properties, types and current and suggested uses for Argo brand methyl glucoside, polyoses, zein, glucuronolacetone, insitol, phytic acid and sodium phytate.—Corn Products Division, Corn Products Sales Company.

Check 4968 opposite last page.

Series of chlorinated biphenyls and polyphenyls, ranging from oily fluids to crystalline powders, are highlighted in a 43-page booklet. Marketed under the Aroclor trademark, products have found more than 100 different industrial and end product uses. "The Aroclor Compounds" — Organic Chemicals Div., Monsanto Chemical Company.

Check 4969 opposite last page.

Water dispersed metallic soaps or stearates are discussed in technical data bulletin. Principal use discussed is as an internal lubricant for ceramics to improve flow, die release and density. Bul N-20—Nopco Chemical Company.

Check 4970 opposite last page.

Industry uses Eastman Antioxidants to control rancidity gum formation embrittlement discoloration decomposition acid formation polymerization

Oxidative deterioration of organic compounds is a complex phenomenon which takes its toll in a variety of ways. Waxes, fats and fat-containing foods turn rancid, gums form in petroleum products, rubber and plastics become embrittled, acid numbers climb in certain aldehydes and alcohols. Many oxygen-sensitive materials can be effectively stabilized, however, through the intelligent use of antioxidants.

How antioxidants function can best be understood by examining the mechanism of autoxidation. One theory holds that autoxidation is a series of chain reactions initiated by an excited or high-energy electron breaking away from an unsaturated hydrocarbon molecule, taking a proton along with it. In effect, this is equivalent to the loss of a hydrogen atom, thus forming a hydrocarbon free radical. If any oxygen is present, the free radical instantly combines with it to form a peroxide free radical.

At this point, the reaction takes one of two directions.

In the first, the peroxide free radical, seeking a proton, reacts with and removes a hydrogen atom from another molecule of the hydrocarbon compound to form a hydroperoxide. The reaction, however, leaves the second hydrocarbon molecule with an unpaired electron, thus creating a new hydrocarbon free radical. The new hydrocarbon free radical forms a new peroxide free radical to react with and remove the hydrogen atom from a third molecule of the hydrocarbon compound, etc., etc. A self-perpetuating chain reaction results.

The hydroperoxides so formed undergo further reactions resulting in the formation of carbonyl compounds. These reactions are not fully understood but probably involve the oxidative action of the hydroperoxides on the double bonds of the unsaturated hydrocarbon or further oxidation of the hydroperoxides themselves. The carbonyl compounds result in an increase in the acid number of various aldehydes and alcohols, and off-flavor and -odor in fat-containing food products.

In the second type of reaction, the peroxide free radical causes crosslinking and chain scission. In plastics and rubber, these reactions are manifest as film embrittlement and general loss of physical properties. High-molecular-weight compounds are formed in petroleum products by the action of oxygenated free radicals on unsaturated hydrocarbon constituents.

Antioxidants are effective because they preferentially supply the hydrogen atom needed by the hydrocarbon free radical to restore its electron ring structure. When the free radical captures the hydrogen atom, its activity is terminated, and consequently the chain reaction that leads to formation of polymers and carbonyl compounds is checked.

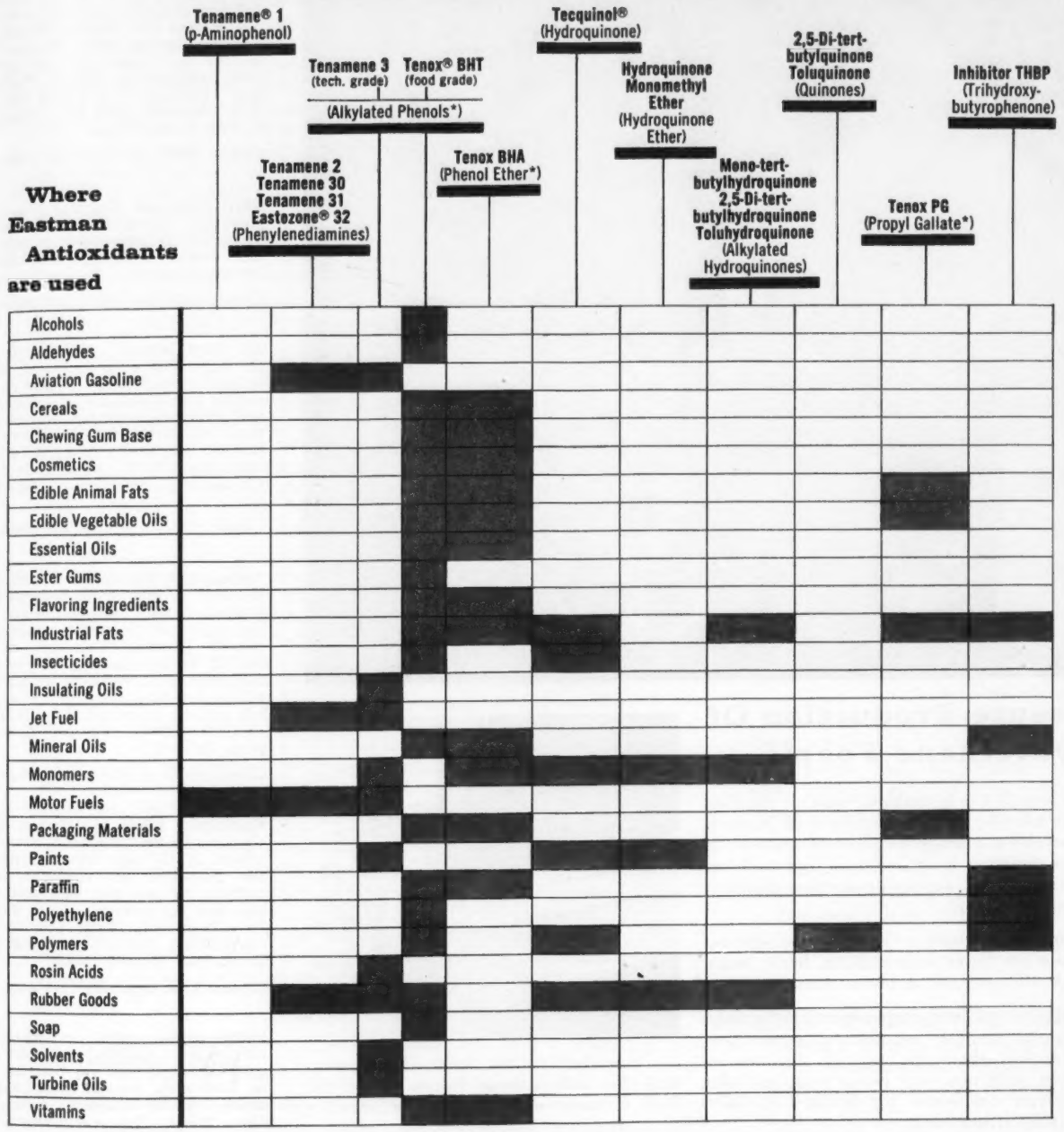
Antioxidants are of three types, classified according to the manner in which they donate hydrogen atoms:

1) Amine type (hydrogen atom comes from the amine group).
   Example: phenylenediamines
2) Phenolic type (hydrogen atom comes from the hydroxyl group).
   Example: alkylated phenol
3) Combination (hydrogen atom comes from both groups).
   Example: p-aminophenol

Eastman antioxidants are performing this function efficiently in the products of many companies, in many different fields. If you have a product that might benefit from protection against oxygen, investigate Eastman antioxidants. Eastman has long experience in this field and maintains fully-equipped laboratories staffed with antioxidant specialists ready to help you evaluate the benefits of using antioxidants in your products. Your inquiry is invited. Write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

Eastman Antioxidants

Eastman Antioxidants



*These antioxidants are supplied alone and in many different ratios and combinations to meet specific processing or service requirements: Tenox 2, Tenox 4, Tenox 6, Tenox 7, Tenox R, Tenox S-1.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, N. C.; Houston; Kansas City, Mo.; New York City; Philadelphia; St. Louis.
West Coast: Wilson & Geo. Meyer & Company, San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

Check 4971 opposite last page.

Epoxy adhesives and potting compounds for high-temperature applications are featured in eight-page booklet. Disadvantages, as well as advantages, are discussed. "High temperature compounds" — The Epoxylite Corporation.

Check 4972 opposite last page.

Bluish red shade dye, Genacryl Red 4B, is described in sample-swatch folder that describes characteristics, working properties, uses and techniques of application. Folder also gives fiber stain ratios. Folder No. G-810 — General Dyestuff Company, General Aniline & Film Corporation.

Check 4973 opposite last page.

Reinforced plastics are subject of 16-page catalog and price list. Included are complete ranges of glass fiber fabrics, polyester and epoxy resins and catalysts, parting agents, hardeners and pigments. Catalog No. 2—Cadillac Plastic & Chemical Co.

Check 4974 opposite last page.

Dimethyl distearyl quaternary ammonium chloride as a fabric conditioner is highlighted in eight-page booklet which also reviews physical and chemical properties, toxicity data and availability. "Arquad 2 HT Fabric Softener" — Armour Industrial Chemical Company, Div., Armour Company.

Check 4975 opposite last page.

Water-in-oil emulsion hydraulic fluids are detailed in technical bulletin which contains typical emulsion formulations as well as a composition for low viscosity emulsion fluids and a formula for an emulsion to be used in high-temperature operations. Bul LG-70 — Chemicals Division, Atlas Powder Company.

Check 4976 opposite last page.

Polyvinylidene chloride latex, Resyn 3600, is subject of technical booklet which supplies all key information necessary for evaluation by laboratory and production personnel. Physical and chemical properties, both for latex and film forms, are described together with formulating information, chemical resistance data and status of Government approval for food packaging applications. Bul 340 — National Starch and Chemical Corporation.

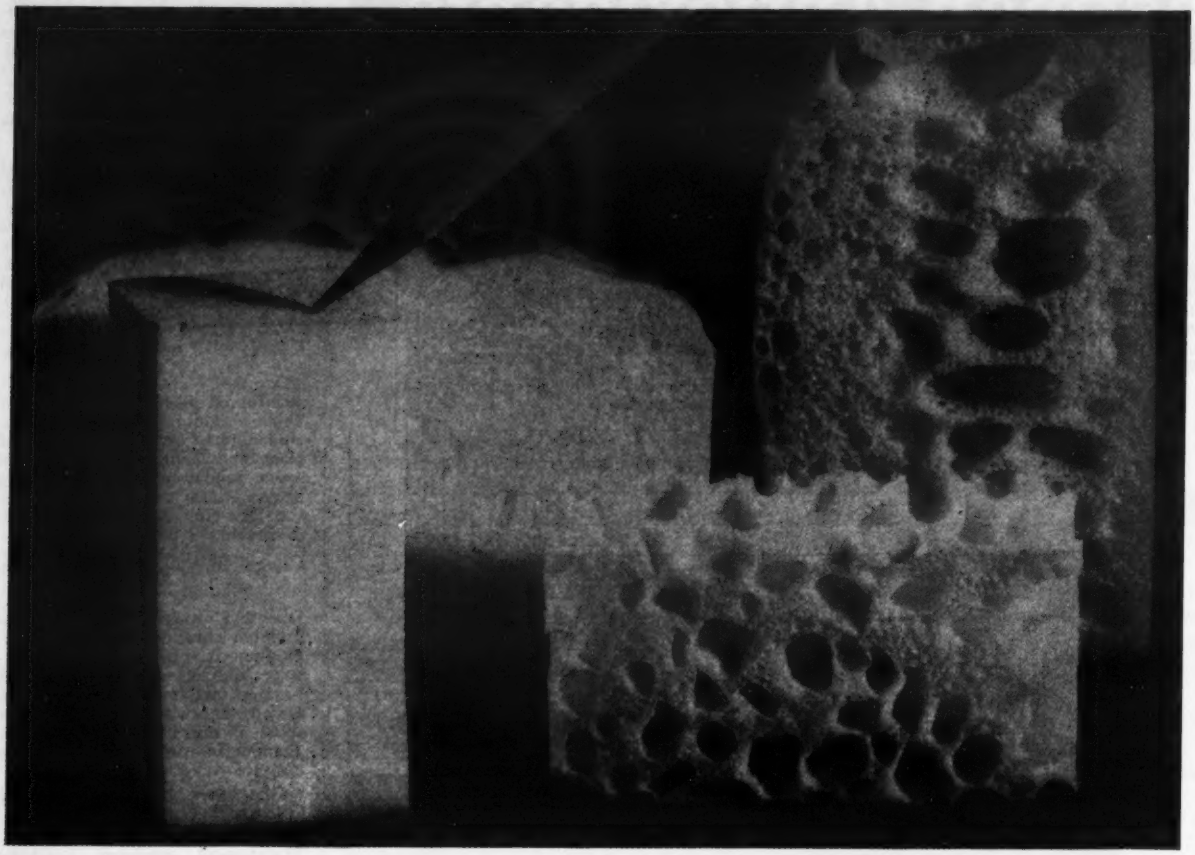
Check 4977 opposite last page.

"HET Acid for Paints, Coatings, and other Applications" is title of technical bulletin of 12 pages. Specifications, physical and chemical properties, typical reactions are given. Bul 40-A—Hooker Chemical Corporation.

Check 4978 opposite last page.

SILICONE NEWS from Dow Corning

Better Foam, Better Profits

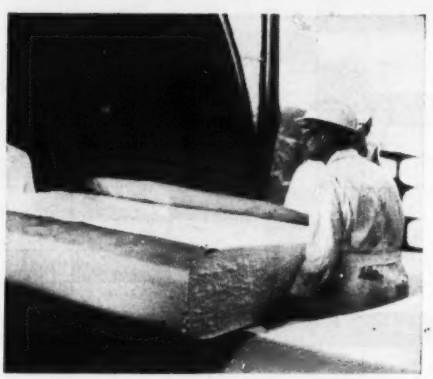


New Silicones Assure Production Of Top Quality Polyurethane Foams

Whether you make prepolymer or one-shot polyurethane foam — rigid or flexible — there's a Dow Corning silicone additive to help you produce uniform foam consistently. These silicone additives take the guesswork out of production. They show no variation from lot to lot and perform exactly the same, time after time to help you step up production efficiency . . . build up repeat sales and improve profits.

Ease of handling is another benefit you get with a Dow Corning silicone additive. Other worthwhile features are lower foam density, better foam stability, and lower costs through effectiveness at lower concentrations.

Dow Corning's leading specialty is research and development in the field of silicone chemistry. That's why our chemists are able to provide you with the newest technical information about the use of silicones in polyurethanes . . . to provide you with new and better materials like Dow Corning 199, the silicone-glycol copolymer for flexible, one-shot polyurethane foam and for rigid, prepolymer foam.



For more information about silicone additives for polyurethane foams, phone the Dow Corning office nearest you or write Dept. 2110.

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Check 4979 opposite last page.

CHEMICAL MATERIALS

Polyalkylene glycol fluids and lubricants are described in booklet of 52 pages. It contains comprehensive data on 32 types of Ucon synthetic fluids and lubricants. Noted are physical properties, physiological properties, physical and chemical analytical methods, storage and handling instructions and special section on selection of the proper fluid for any given application. "Ucon Fluids and Lubricants" — Union Carbide Chemicals Co., Div., Union Carbide Corporation.

Check 4980 opposite last page.

Vinyl plasticizer Hercoflex 900, a polymeric, high-boiling permanent plasticizer, is the subject of technical data sheet No. 249—Hercules Powder Company.

Check 4981 opposite last page.

An inert mineral extender for urethane foams is presented in bulletin of eight-pages. Report describes how costs can be reduced and presents suggested formulations, compares various properties and graphically shows test results. Bul TI-260 — Minerals & Chemicals Corporation of America.

Check 4982 opposite last page.

"Schenectady Resins for Emulsion Polishes" is title of an illustrated booklet dealing with alkali-soluble resins and the wax-compatible terpene phenols. Uses are described briefly and suggested formulations, preparation techniques, polish evaluations and test methods are also discussed. Form S-71 — Schenectady Varnish Company, Inc.

Check 4983 opposite last page.

Reinforcing silicas and silicates in elastomers are comprehensively treated in 108-page report. Types and properties are discussed in addition to manufacturing methods and applications. Hi-Sil Bul 20—Columbia-Southern Chemical Corporation, Subsidiary of Pittsburgh Plate Glass Company.

Check 4984 opposite last page.

Surface-active agents' cost saving advantages, qualities, characteristics and end-uses are described in illustrated booklet. Nacconol series booklet—National Aniline Div., Allied Chemical Corporation.

Check 4985 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Creativity Lacking? *From page 27*

New York City, the motto appears: "The asset which towers above all others in business is not money, not buildings, not land, but men." Who are the towering men among U. S. chemists today? Among them are Robert Woodward, William S. Johnson, Saul Winstein, Glenn Seaborg, Melvin Calvin, Wendell Stanley, Herman Mark, Herbert C. Brown, George Kistiakowsky, Henry Eyring and Linus Pauling. How many chemical companies could accommodate themselves to such a man as Pauling?

In other countries, where a creative genius has clearly established his unique creativity, the organization is often built around the man. This was done with Reppe in Germany. A large institute was built around Svedberg in Sweden. Ziegler is supported by the Max Planck Institute for Coal Research. He need not work on coal, however, but has freedom to do as he wishes. Much of the Montecatini's success is due to the contributions of Natta. In the U. S. less effort is made to use the full abilities of our creative scientists.

Where can the chemical industry get men of stature for research? They are not inclined to leave American universities or to come over from Europe. Perhaps the answer is for industry to develop them themselves, but this is a long and difficult process. Some think it impossible with industrial research conducted as it is at present.

Is Industrial Research Conducted Properly?

Many industrial laboratory scientists are trained to think toward narrowly defined objectives and often to work by empirical methods. When large groups of research chemists have been trained to work this way, they are not easily changed. Such an atmosphere is not conducive to the discovery and development of creative talent in the laboratory of an industrial concern.

Use of research directors who are not primarily research men is also felt to be a handicap. It's not enough to tell a new research chemist to go ahead and be creative and select his own areas to pursue. These new research chemists need to be carefully guided by someone with experience in the field, who can by constant association transmit to the new man his experience, judgment and critical sense.

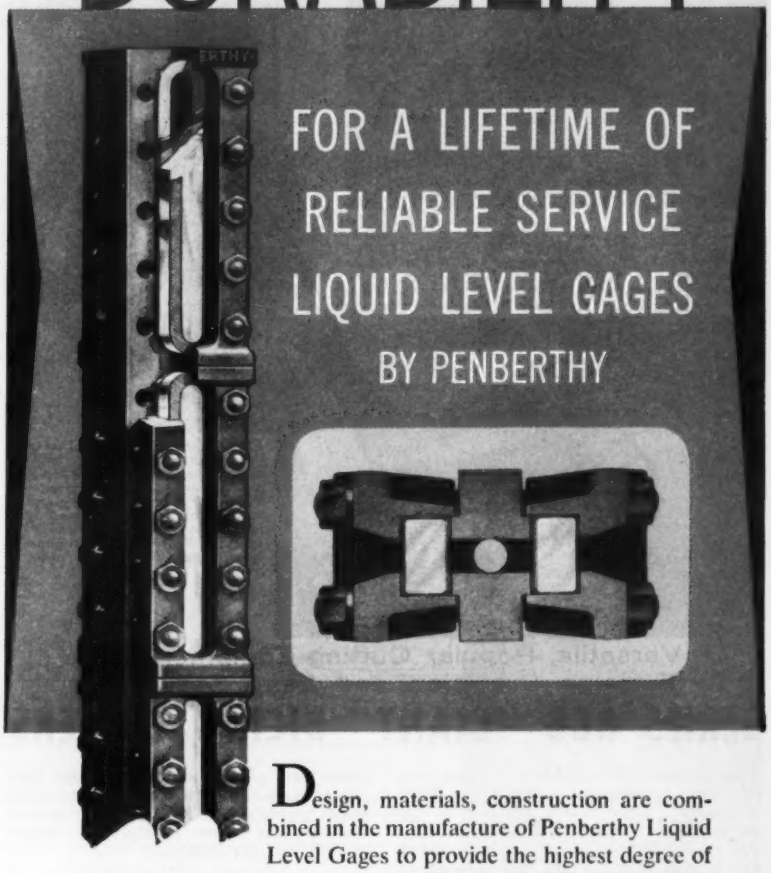
Having an administrator direct a research laboratory is like having a straight administrator as the head of an army. Such an army might be perfectly organized, but when it comes time to go to battle, a general is needed who understands military tactics, who possesses the experience and judgment to recognize breakthroughs.

If research is not properly directed, this is a terrific handicap. If every minute must be accounted for to turn out something quickly, research will take shortcuts and will suffer. A management which is non-sympathetic to research is an added burden.

Some industrial research departments are over-organized and try to make individuals conform to the system, dampening creativity. One company has eleven different levels of organization in its research department. Creativity is hampered by too much emphasis on report-writing procedures, allocation of time spent on individual projects and inflexible rules.

A visitor to a major chemical company was told it was company policy not to make discoveries, but to take advantage of discoveries made by others. Dr. Jules D. Porsche, staff assistant to vice president, research division, Armour & Company, states that many companies may say they want creativity, but they really don't. They can't use it. It costs too much money to evaluate really new ideas and develop them. It is more economical to use ideas already

DURABILITY



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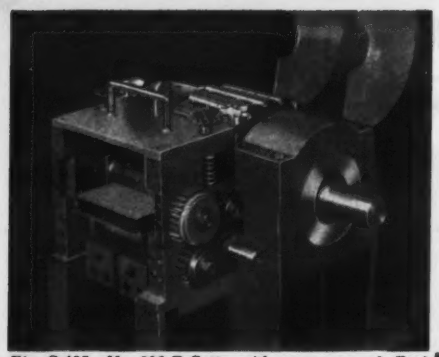

Fig. G-135 No. 806-F Cutter with covers removed. Feed roll assembly locked in place. The feed roll drive is driven by gears and is easily and quickly replacable as required for maintenance. The side pieces are split and hinged so that the top plate, top feed roll, and its bearings can be swung back on hinges. By this construction, clear access is given to the feed rolls, fly knives and bed knives for cleaning.

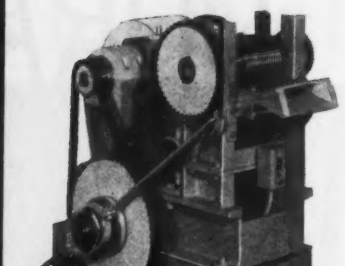

Fig. G-134

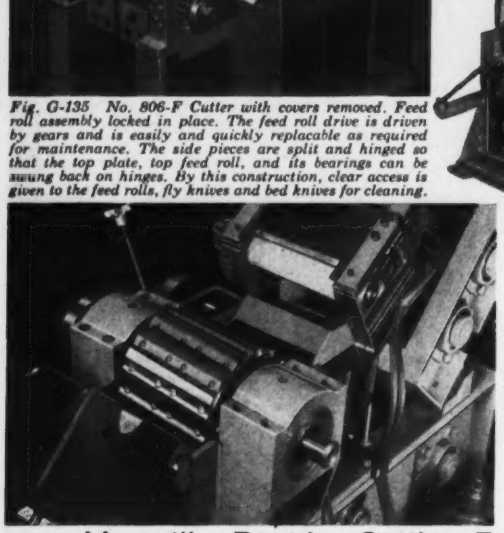

Fig. G-136 No. 806-E Dicing Cutter showing circular knife assembly swung back out of place. Feed assembly is also mounted on hinges for ease of cleaning and maintenance. The cutterhead is mounted on heavy Timken bearings with the bearing housings an integral part of the main frame.

Versatile, Popular Cutting Equipment for Extreme Precision and Easy Servicing

SERIES 800 "GIANT" DICING CUTTERS

The Series 800 GIANT Dicers are extreme precision, medium duty machines. They have proven to be very popular in the plastics industry for producing pellets from both sheet stock and rods. They are offered in two widths for dicing sheet stock 8" and 16" wide. For cross cutting rods into pellets, they are offered in widths of 6", 10", 14" and 18". These machines are built of either carbon or stainless steel. They are ruggedly built with an 8" diameter cutterhead with 2¼" main bearings.

Speeds of up to 2400 R.P.M. are standard and in some cases have been operated at 3000 R.P.M. For example, a No. 818-F Cutter with eight knives and a cutterhead speed of 1200 R.P.M. will cut strands of ¼" diameter polypropylene plastic strands at 100 feet per minute. With sixteen knives, this same machine at 2400 R.P.M. would handle this same extruded material at 400 feet per minute.

The cutterhead may be equipped with 2, 4, 6, 8, 12 or 16 fly knives (for cross cutting) depending on the speed of the sheet stock and the length of the cross cut. The knives, due to the fact that they have a sharp bevel and shear action, cut rather than break. This gives much less dulling effect and hence stay sharp for long runs.

If you have a cutting problem, call or write today, without obligation, for complete information. Remember, if it can be cut a "GIANT" Cutter can do it better!

WE'LL BE GLAD TO CUT SAMPLES—FREE

One of the services which we gladly perform for anyone interested in our machines is to cut some of their raw material so that they can see exactly what they will get, before they buy a machine. If you desire this service, just send us a small sample of your product along with information as to size of pellet desired.

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Check 4987 opposite last page.

Creativity Lacking?

From preceding page

proved out by others or produce products similar to those already on the market.

Management wants results quickly that mean dollars. A research director at another medium-sized chemical company feels that Dr. Brown's remarks are absolutely true, but doesn't know just what he can do about it. Despite wide discussion of the need for more basic research and creativity, management in many companies has only a vague or distorted idea of the subject, relating it to employee benefit plans or recruitment.

The American chemical industry, although it is the leader in the world, is still a young industry. Up to now, most of its efforts have been to commercialize the chemical knowledge already available — and it has an enviable record in doing this. But now the industry has reached the point where it must sink deeper shafts in order to maintain its leadership.

All is not black, however. A number of chemical companies are taking steps to do something about creativity in research lest the wellspring of American chemical greatness run dry. Some things that are being done will be reported in the next article of this series. ■

Boom in Leasing

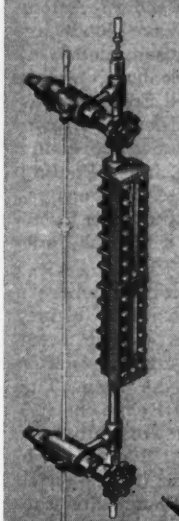
From page 30

lease for other reasons such as to speed acquisition of equipment, avoid exceeding a budget, charge equipment against a specific government contract or other considerations. Leasing should be looked upon as one of several methods of financing.

Other methods of financing are not as low in cost as sometimes thought. A recent study showed that the average cost of business financing is 11%. Bonds and stock are subject to commissions and costs for printing, registration, and correspondence. Considerable executive talent must be used in planning and executing such company fi-

When you need

HEATED GAGES and VALVES



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Jerguson Heated Gages and Valves are built to meet the special conditions present when working with liquids which must be kept at higher than ambient temperatures . . . for process reasons or to hasten the speed of response to level changes. They also have wide application to prevent breakage through freezing.

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nancing. Leasing is quite simple.

Some people have the idea that a leasing company has a warehouse full of equipment available for leasing. Actually, equipment leasing company officials may never see any equipment and prefer it that way. The lessee specifies his equipment just as if he were purchasing it and sends orders to leasing company. The leasing company then signs the orders agreeing to pay for the equipment under the terms of the contract and sends these orders on to the manufacturers specified.

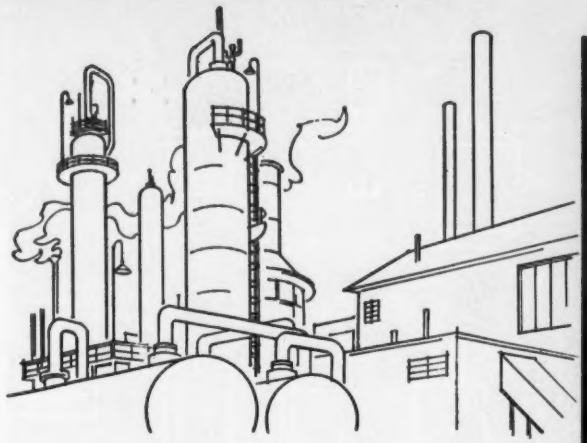
Leasing Pioneers

Although a great number of companies are now in the field, a large portion of the business is being done by a few companies who pioneered in equipment leasing. Although it has now spread to every corner of the U.S., the leasing business started on the West Coast.

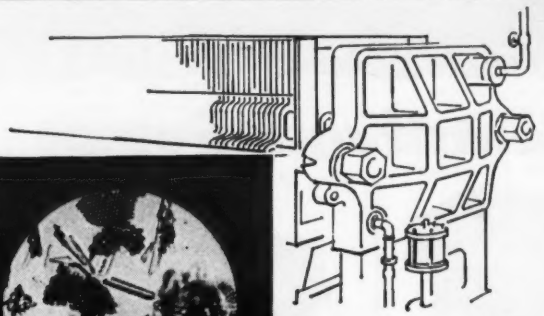
The largest company in the equipment leasing business is U. S. Leasing Corporation, with headquarters in San Francisco. It will lease about $25 million worth of equipment in 1960, an increase of more than 50% from the $16 million leased in 1959. U. S. Leasing began its operation in 1952 by providing its clients with fork-lift trucks, pallets and bins. It was incorporated the same year it was formed, with stock offered to the public.

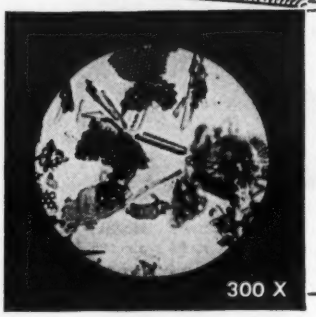
D. P. Boothe Jr., of San Francisco, who served as the first president of U. S. Leasing from 1952-54, resigned and formed Boothe Leasing Corporation in 1954. This company has generally been considered the second largest one in the leasing business. It is currently leasing equipment at a rate of $1 million per month, also a 50% increase over 1959. Company also has publicly owned stock, which has increased five times in value since 1954.

Nationwide Leasing Company, with headquarters in Chicago, expects to do 250 to 300% more business in 1960 than in 1959. Company was



For flow rate plus clarity—Hyflo Super-Cel has the right combination of large and fine particles. Heavily used in chemical processes such as caustic soda production.





For fast flow rates—Celite 545 has a higher proportion of coarse particles. Frequently used for clarification of resins and other viscous liquids.

For maximum clarity—Filter-Cel has a relatively fine particle size distribution. Used in producing lard, salad oil, other hydrogenated oil products.

In diatomites, Johns-Manville precision processing works for you

Celite has the exact grade for every filtration need from fast flow rate to maximum clarity

Study samples of various filtration grades of Celite* diatomite with the unaided eye. Rub them between your fingers. One grade looks, feels very much like another.

Then compare these grades under the microscope. Each has its own distinctive particle size distribution. Each is precision-milled to fill the most exacting filtration requirements, ranging all the way from maximum flow rate to maximum clarity.

Celite 545, for example, with a higher proportion of large to fine particles, is used to remove large suspended impurities at maximum flow rates. *Hyflo Super-Cel®* has a balanced particle size distribution, combines good liquid clarity and moderate flow rate. But *Filter-Cel®* has a much higher ratio of small particles, is tailored for use where high clarity outweighs flow rate.

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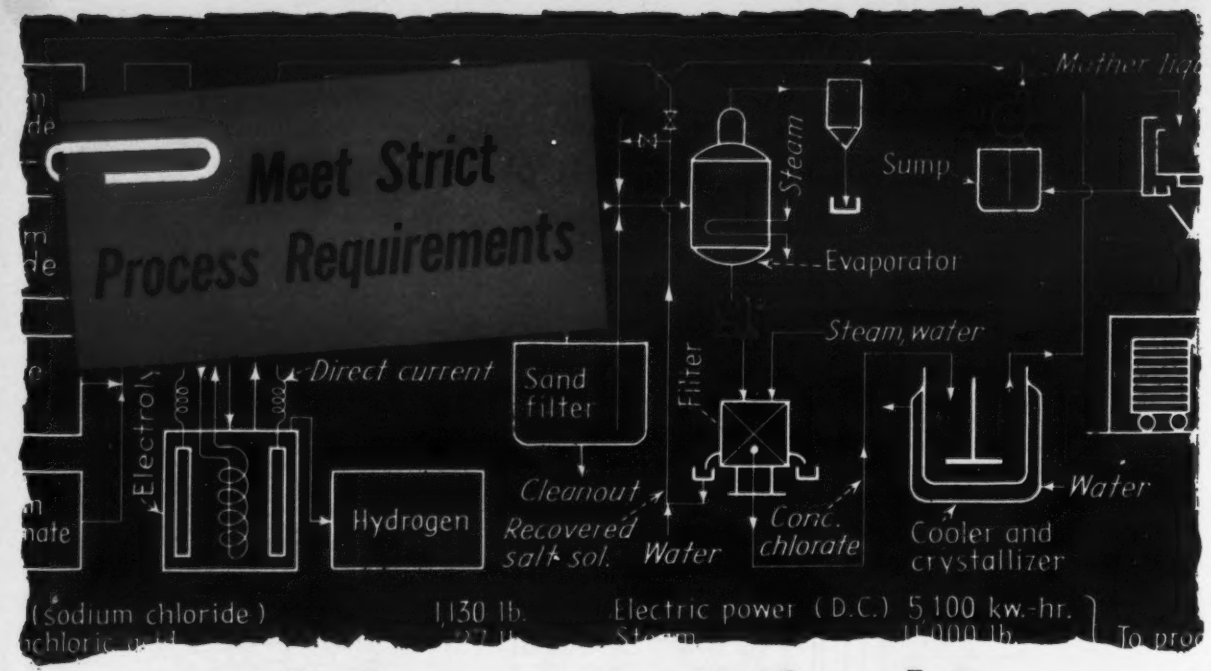
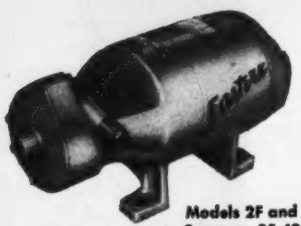


. . . with Eastern Centrifugal Pumps



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Model D-11
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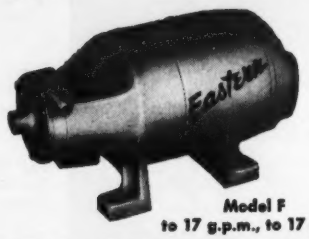

Model F
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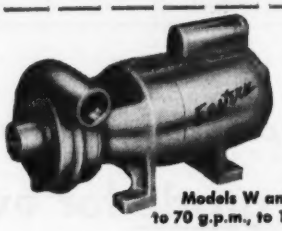
Models U-17 and U-34
to 38 g.p.m., to 21 p.s.i.



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Models 3F and 3J
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Recent redesign of these close-coupled Centrifugal Pumps has gained tremendous ruggedness and allowed for a wide selection of power requirements. In every detail of size, weight, space requirements, power, and costs, Eastern pumps fill the bill for strict process standards.

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Eastern's engineering service offers many special models to meet your specific needs as to capacity and construction. Recommendations entail no obligation, and your inquiries are invited.

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Eastern Centrifugal Pump Catalog contains engineering data, performance charts, diagrams and helpful general information. Request Bulletin 130-E.

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Boom in Leasing

From preceding page

founded in 1957 by Robert E. Sheridan, who is president, and Walter E. Heller.

Mr. Sheridan is a 32-year-old mechanical engineer. In his previous employment at Westinghouse and later at York Corporation, he was marketing technical products. In this work he became convinced of the value of leasing, which led to his forming the partnership with Mr. Heller. His previous experience explains why Nationwide specializes in using leasing as a sales tool.

Mr. Heller is well known for his association with Walter E. Heller & Company, one of the largest commercial finance organizations in the country.

Fifty Other Companies Have Entered Field

It is estimated that about fifty other companies have entered the equipment leasing field since January 1959. One of these is Hertz Corporation which started an equipment leasing division in early 1960.

Other companies well known in field are Commercial Investment Trust, Talcott Leasing Corporation and Equitable Leasing, all with headquarters in New York City. National Equipment Rental is on Long Island. Bankers Leasing Corporation is in Boston and American Leasing is in Hartford. American Industrial Leasing is in Chicago and National Equipment Leasing in Los Angeles. Two others are Chandler Leasing Corporation in Cambridge, Mass. and Ryder Leasing in Miami.

Some thought should be given by the lessee to the importance of dealing with a substantial and financially responsible lessor. In the early days of leasing, the lessor was regarded as sort of a pipeline between investment funds and the user of the equipment financed by these funds. With the passage of time, it became evident that the lessor had a much more important role due primarily to the need of continuing service of the lease on his part

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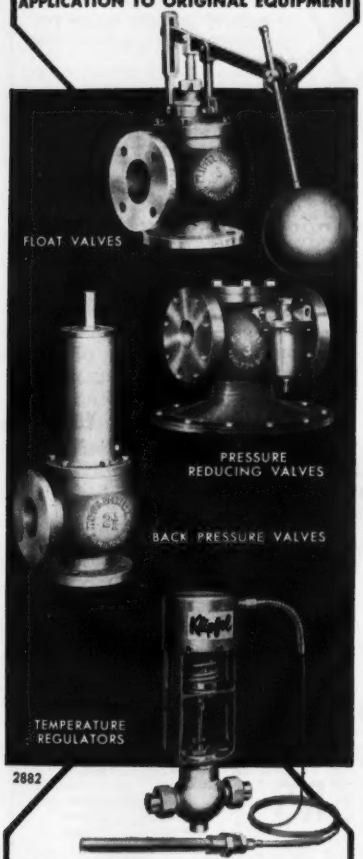

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Check 4991 opposite last page.

and the legal and tax problems which arose.

In the case of a collapsible type of lessor, the lessee frequently found himself in a position where, at the expiration of the original lease, he had no party with whom he could deal in clarifying title to the equipment or in negotiating the renewal of the lease or the purchase of the equipment.

He further found that personal property taxes or sales or use taxes might have been overlooked during the term of the lease so that with interest and penalties, a very large tax lien would be built up against the property. All of this would be both surprising and onerous to the lessee. Inasmuch as these liens were against the lessor and against the leased property, he found himself in a position where his ability to negotiate was questioned.

Check Lessor Standing

The lessee should investigate, through his bank or other information sources, the financial standing and reputation of the lessor inasmuch as he is contemplating a long term relationship.

In this connection, U. S. Leasing has capital funds of $10,000,000 and Boothe Leasing has about $7,500,000. The capital funds of Nationwide Leasing are not known, but that company's association with Walter Heller gives it stature and responsibility. Talcott Leasing obtains its strength from a reputable and long-established factoring house. Hertz has an excellent reputation.

The American Management Association will hold a seminar on leasing Oct. 3-7 in New York City at Hotel Astor. The AMA also plans to hold a three-day seminar on leasing at the Ambassador Hotel in Los Angeles during the first week of December. Either of these seminars provides a splendid opportunity for you to probe further into leasing and learn how you might be able to use it to advantage in your future planning. ■

A new shaft seal to handle the most corrosive service conditions has been recently added to the John Crane line. Here's a seal that will stand up under all conditions of acids and salts, oxidizing agents and organic compounds.

It is so designed that all parts that normally contact the fluid are made of chemically-inert DuPont Teflon. Also, for this same reason it can be operated over wide temperature range up to 250° F.

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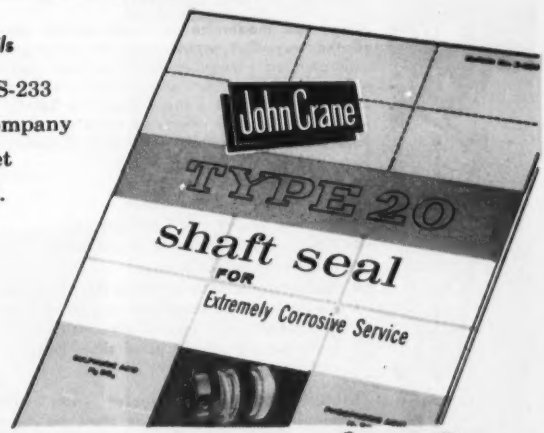

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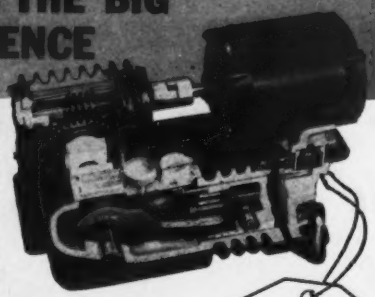
UNITIZED CONSTRUCTION MAKES THE BIG DIFFERENCE



Unitized construction means it's completely enclosed, locked in permanent alignment, sealed against leakage, dirt and weather. All moving parts inside run in oil. Heavy duty design includes machine cut gears, outboard bearings on pump drive shaft. Solution heads of special materials available for slurries, corrosive liquids. Four standard sizes, up to 54 GPH, pressures to 300 psi. Duplex units double the capacity with one motor.

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Check 4994 opposite last page.

Oil and Plastics

From page 35

lab is staffed by 1700 persons, of which over half are technologists.

"Technical service is a critical sales expense factor," says an executive of another chemical company major to the field. "In addition to growing lab costs, it requires travel away from the office of your best, most experienced engineers.

"Only way this can be economically justified is by spreading the men's time over a number of product types in your line. I don't see how anyone with a one-product line can compete."

Integration and Joint Ventures Worth Consideration

Integration, at least to a degree, is favored by some plastics people. They say there are too many steps between raw material and consumer, that we have a "luxurious" system.

Take the case of vinyl upholstery. An oil company sells ethylene to a plastics producer who makes compounded polymer for a fabricator of film and sheeting. This product goes to the upholstery manufacturer who sells to distributor, who supplies jobber, who puts product in retail outlet.

Rexall, on the other hand, is integrating forward, has acquired two film producers, as well as one pipe, one bottle and one tape manufacturer.

All of these outlets use polyethylene — to the tune of 30 million lb/year.

Can one 30-million-lb plant supply these needs? No, say industry men. Each product requires a different type of polymer — and a good deal of continuing R&D, both process and product, will be required to provide the competitively best materials.

Another example of integration is the packaging manufacturer who goes into film production to meet his own needs.

This is fine, say plastics people, as long as he launches and maintains an aggressive R&D program. Average life of a packaging film material is 18 months. Preoccupation with a successful material of today

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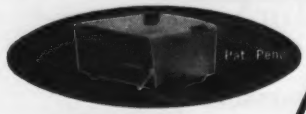
ON SOLIDS FOR DENSITY AND SPECIFIC GRAVITY DETERMINATIONS



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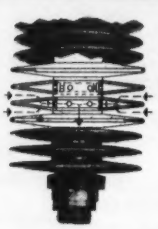

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may cause a rude awakening tomorrow.

One solution to the oil industry's needs may well be in joint ventures with chemical companies rich with polymer manufacturing and marketing experience.

Creative Research A Must

Perhaps the knottiest problem to all newcomers, however, is how to get into and catch up with the basic research that is increasingly essential to survival in the big-time marketplace. Author Talley (2) feels the oil industry has yet to prove itself capable of the creative basic research essential to development of new plastics.

On the other hand, Jersey Standard, with more than three years work and $15 million, came up with a continuous propylene process of its own, based on improved catalyst.

The point, however, is a serious one, regardless of one example to the contrary.

Perhaps this problem is bigger than any our oil and plastics industries have yet really had to cope with. We aren't the only ones in the basic research race. Our successes have been with production processes and in the marketing labyrinth. Western Europe has nurtured many of the basics of recent years; emphasis is increasing in countries further east.

Literature cited:

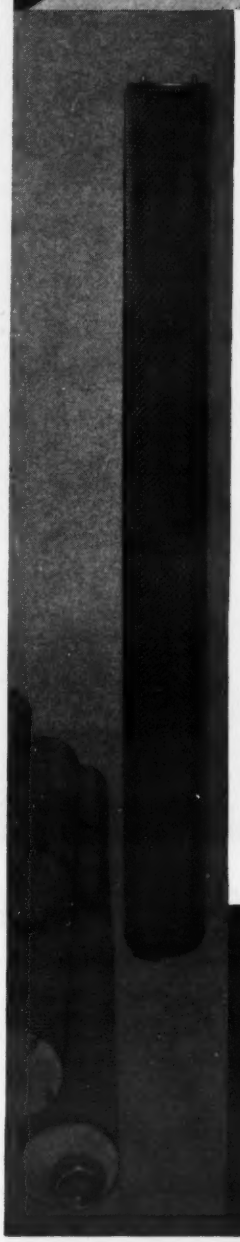
1 — Levitt, Theodore; "Marketing Myopia," Harvard Business Review, July-August 1960.

2 — Talley, Walter J., Jr.; "Oil may find tough sledding in plastics," Oil and Gas Jour., Vol. 58 No. 21, May 23, 1960.

Executive Health

From page 37

To perform this unpleasant task we ourselves must first be upset. Since we believe emotional upsets harmful, we attempt to control our upset emotions, thus aborting the drive to action. The end result is an increase in tension of all concerned. *To page 88*



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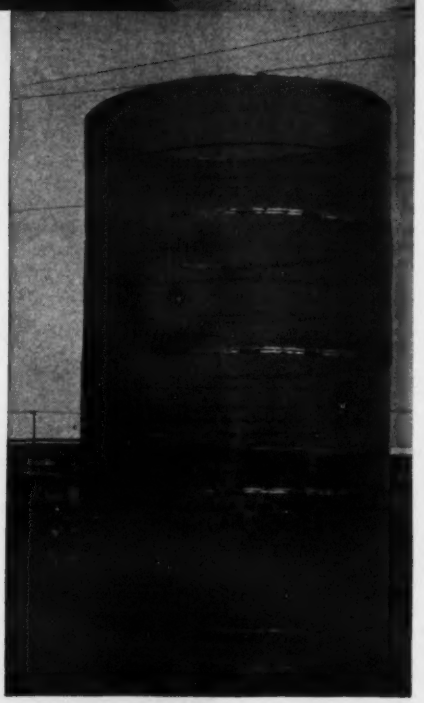

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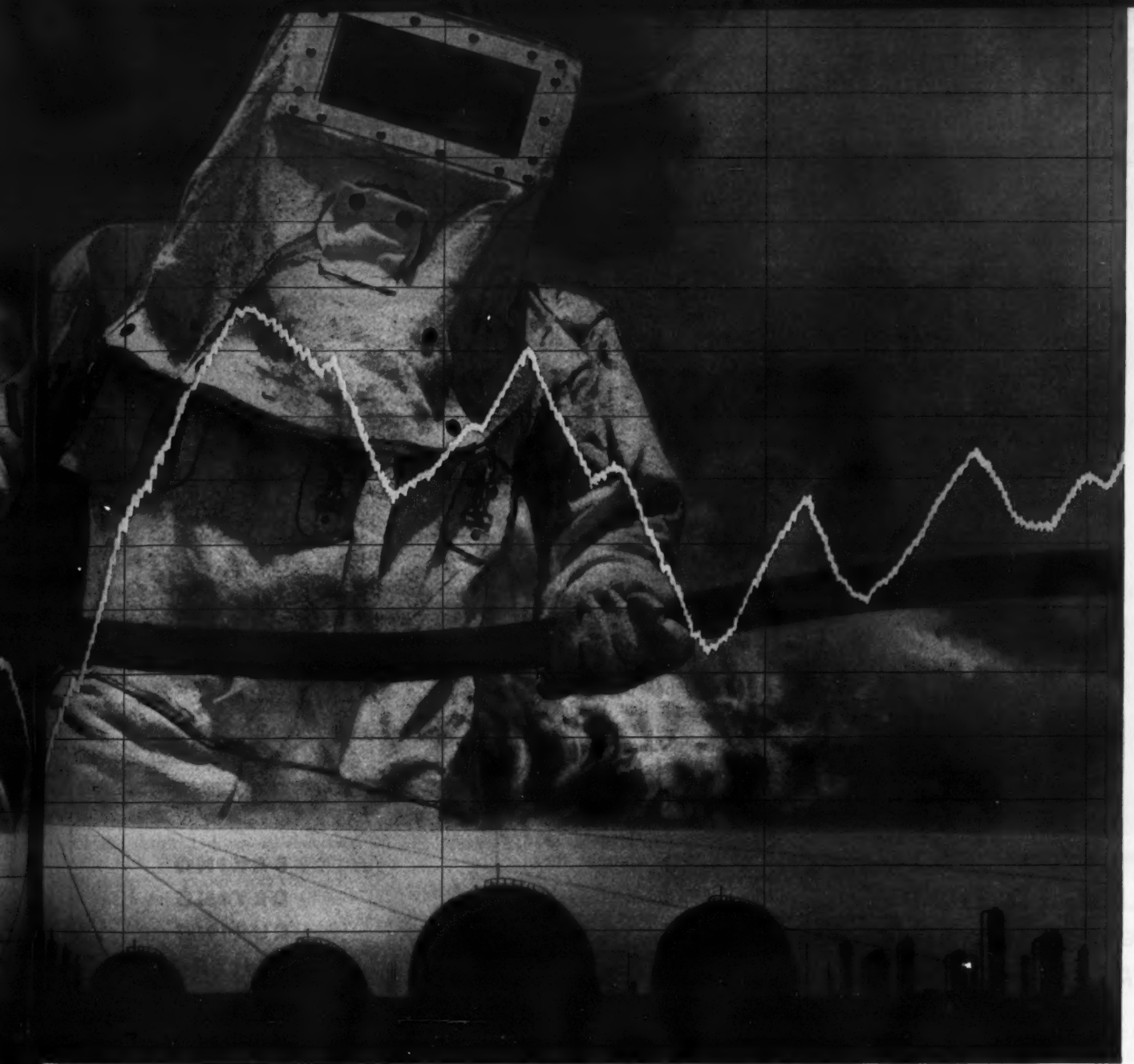

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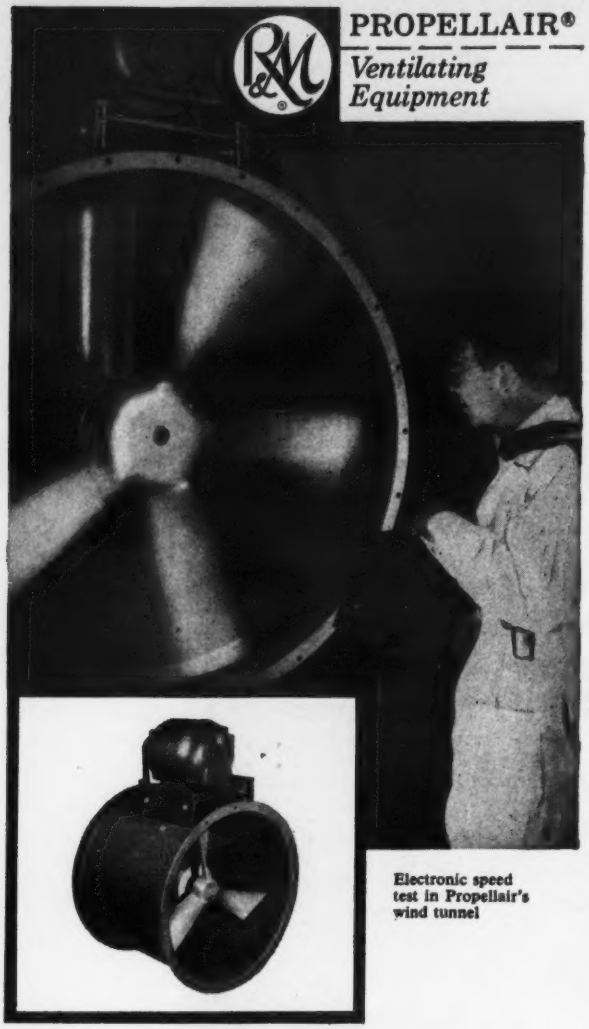

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Executive Health

From page 85

Modern man seems to have forgotten that life is basically a conflict.

The full, free life which sometimes includes a good scrap has been submerged in a utopian desire for eternal harmony and tranquility.

An individual who refuses to permit himself to become emotionally upset about a business situation because, in advance, he presumes it to be hopeless, is missing out on solutions which might be forthcoming if he permitted his healthy emotions to motivate his quest.

The other extreme has men attempting to do the impossible. There is widespread belief that management and supervision can and should make all their subordinates happy — not simply provide a healthy atmosphere in which they can find their own salvation.

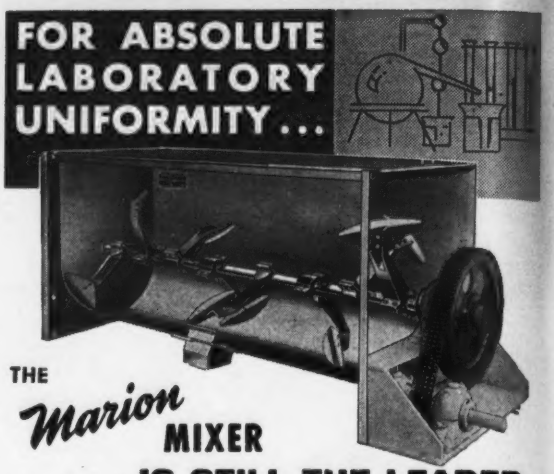
It is an impossible task for anyone to make another person happy other than to so conduct himself that he does not unduly interfere with the individual's finding his own salvation. Yet I have talked with supervisors who were thoroughly frustrated when an employee refused to be happy under their supervision, as though it were entirely the supervisor's fault.

There is in this situation a danger for the subordinate as well as for the supervisor. Creating an atmosphere that tacitly implies that the efforts will make an employee happy leads him to expect this miracle. When the efforts fail, employees are bitter and resentful. This is not to say that people do not react well to decent, fair, honest treatment, but can we do more?

Do not misconstrue my remarks to mean that people do not occasionally work too hard or need a vacation, or that every problem will have a handy solution if we just get angry enough.

I am only warning against using any panacea to evade meeting with effective personal action the real problems of our daily lives; warning against evading the internal discipline exercised through the emotions by our own bio-

FOR ABSOLUTE LABORATORY UNIFORMITY...



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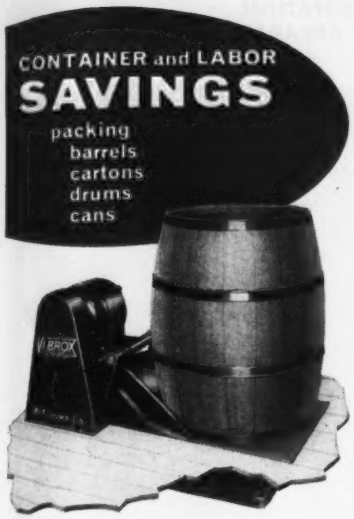

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A rugged, mechanical packer, the Vibrox gets more of the material into the same size container . . . or the same amount into a smaller container. Users frequently report savings up to 20% in container costs alone—and additional savings of 15 to 33% in packing time.

The hard-working Vibrox requires no attention on the part of the operator. It operates continuously, packing the material down as the container fills. With a conveyor to carry the containers to and from the packer, the Vibrox makes a tough job easy—and economical.

If you pack a bulk material—in boxes, cans, cartons, kegs, drums or barrels weighing up to 750 pounds—find out what a Vibrox Packer will do for you. For specific recommendations on your packing problems, send a description of the material, and data on the type and size of containers. You incur no obligation, of course.

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For details on other Gump processing equipment, refer to your copy of Chemical Engineering Catalog.

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Check 5002 opposite last page.

logical drive to survive.

To sum up, man brings upon himself most of his misfortunes, his failures and stress disease by striving to make himself over into something allegedly finer and more nearly perfect than nature intended — devoid of his emotions.

The inevitable failure to accomplish this leads him into frustration to which there is no end.

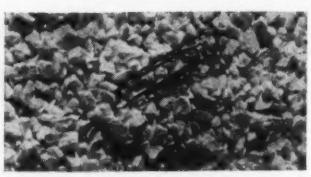
Fortunately, this type of frustration is quite different from that he deliberately seeks in playing golf.

For in golf, there is reasonable hope (although perhaps a slim one) that some day he can learn to play the game well. ■

Housekeeping costs cut, uniformity improved by granular starch

Uses: Starch is specifically intended for enzyme conversion.

Features: Dustless, high-density, flash-dried starch in granular form stores more compactly and wets out quickly. Dust-free feature of product reduces housekeeping costs. More uniform particle



Densified starch has smooth, regularly shaped particles. Moisture content and pH are closely controlled

size, moisture content, and pH mean less enzyme is needed for conversion.

Description: Manufacturing technique forms regularly shaped particles which assure complete emptying of bags. Firm particles resist abrasion. Material, Easy-Enz 3387, is available in both bags and bulk.

(Easy-Enz 3387 starch is product of Corn Products Division Corn Products Co., 10 E. 56th St., N. Y. 22, N. Y.)

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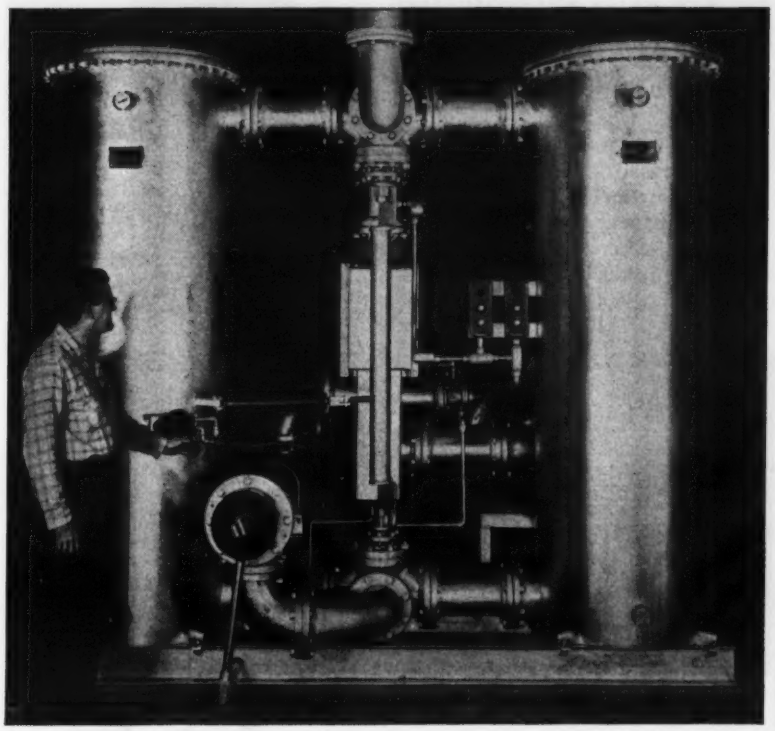
NEW SLANTS ON HEAT PROCESSING FROM SELAS

continuous, automatic drying of compressed air, process gases and liquids with Selas Dehydrators



• *Low pressure dehydrator for continuous drying of furnace atmosphere and low pressure process gases. Closed-cycle reactivation is utilized; preventing contamination of the process gases with air or other diluents.*

Selas offers a standard line of steam and electric reactivated Dehydrators . . . internal (with the heater imbedded in any commercial desiccant for low equipment cost) . . . external (where more positive reactivation heat control is desired). Selas Dehydrators are available in low pressure series and high pressure series to handle compressed gases.

In addition to the standard line, Selas custom-builds units for large volumes, special conditions, extreme pressures and unusually low dewpoints.

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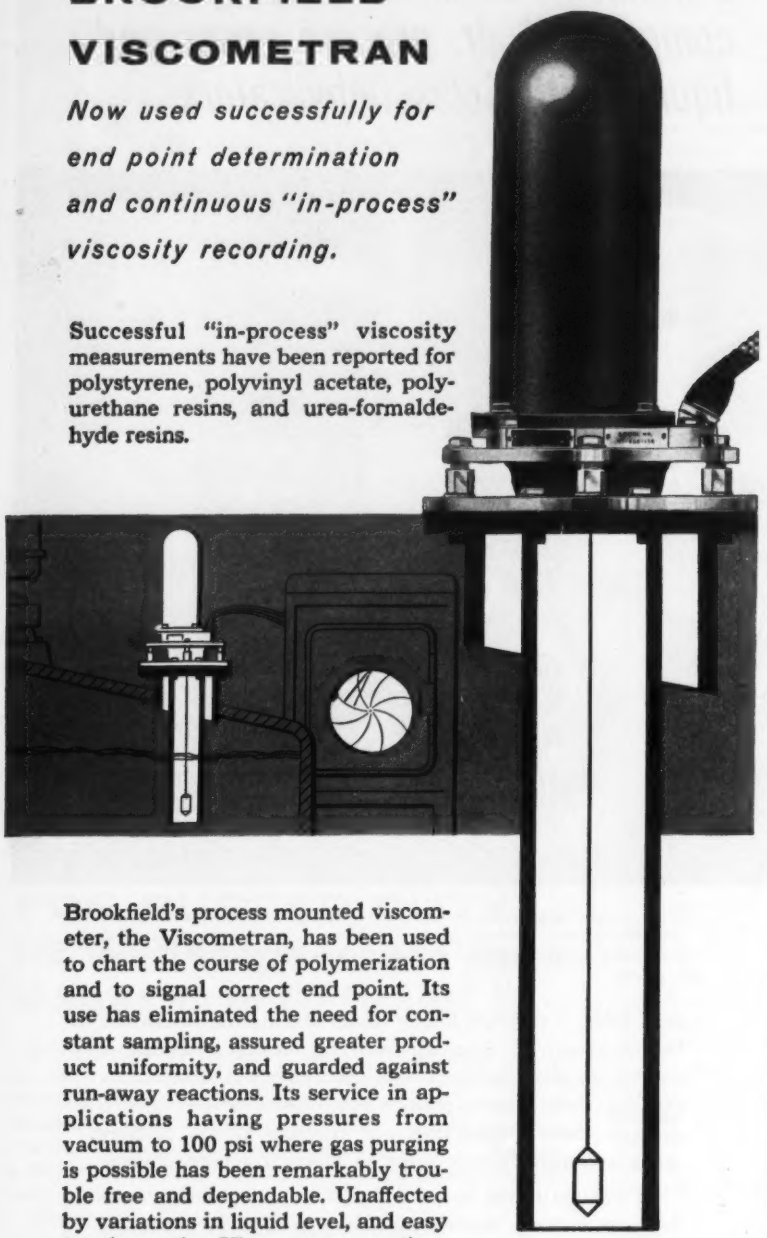
Successful "in-process" viscosity measurements have been reported for polystyrene, polyvinyl acetate, polyurethane resins, and urea-formaldehyde resins.



Brookfield's process mounted viscometer, the Viscometran, has been used to chart the course of polymerization and to signal correct end point. Its use has eliminated the need for constant sampling, assured greater product uniformity, and guarded against run-away reactions. Its service in applications having pressures from vacuum to 100 psi where gas purging is possible has been remarkably trouble free and dependable. Unaffected by variations in liquid level, and easy to clean, the Viscometran continuously and accurately senses viscosity — a variable that can very well be fundamental in your process.

For new application data sheet write or wire:

Brookfield the world's standard for viscosity measurement

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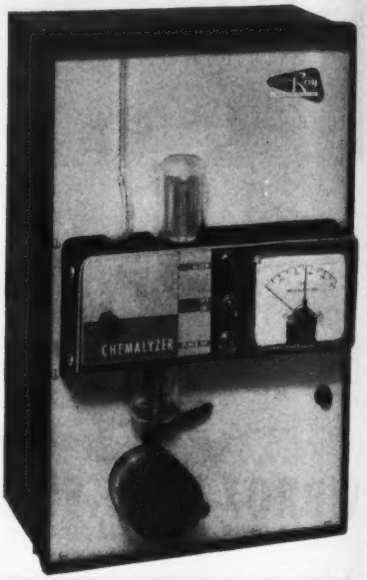


Automatic colorimetric analyzers are being installed and tested in plants of a leading chemical company to monitor boiler-feedwater hardness. Test results have shown major improvements over former manual-titration methods

"*. . . automizing the colorimetric method is an advance as significant as the advance from soap titration to colorimetry.*" These are the words of one of the water consultants who have been working with a major chemical company recently in installing and testing automatic photoelectric colorimeters for boiler-feedwater analysis. A report on results they have experienced with this technique appears below.

Automatic colorimetry proves out in boiler-feedwater analysis

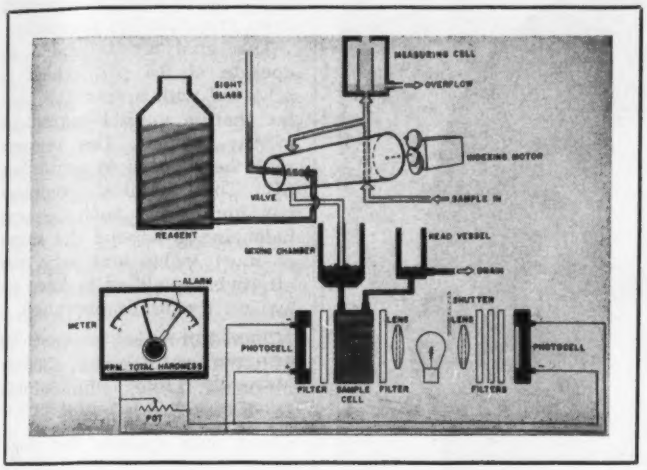
Results to-date of a large CPI firm's transition to automatic colorimetric determination of hardness in boiler feedwater indicate solid improvements over manual-titration methods in the areas of accuracy of measurement, manpower requirements, personnel-training needs and equipment downtime.

The organization is now installing the fully automatic photoelectric colorimeters in the first of its many plants. Here, for instance, a single analyzer monitors five water softeners by using solenoid valves to open and close sample supply to the instrument.

One colorimeter is also being carried from plant to plant to test its efficiency and accuracy in a variety of situations. So far it has operated in four plants with water-treatment capacities in 50- to 2000-gpm range. Normally this unit is rack-or bench-mounted adjacent to the process being monitored. It stays in a plant three or four months for full evaluation.

The colorimeters are now being used with a visual alarm. However, when they are placed in routine operation they will be tied into plant annunciator systems.

Hardness-accuracy specifications of 0-3 ppm for the colorimeter have been borne out. At one plant the unit has indicated hardness of 0.5 to 0.8 ppm. This is lower than the chemical company's tech-



Automatic Colorimeter Operation

Analyzer's measuring cycle is diagrammed above. It is designed for round-the-clock monitoring of hardness, residual chlorine or phosphates at three-minute intervals.

In monitoring softeners, photoelectric colorimeter unit is coupled with audible or visual alarm. Or, it can automatically initiate regeneration of spent unit or cut-in of fresh unit at first indication of hardness breakthrough. Color of sample solution varies from pink or red in high-hardness water to blue in zero-hardness.

In operation, unit takes sample from line, adds specified amount of reagent to it, and then measures amount of monochromatic light transmitted through sample-reagent mixture. Double-beam optical system is used. Filters give zero reference.

Multi-port plug valve meters both reagent and sample and programs the operating cycle. Valve is reciprocated between its two operating positions by an indexing motor.

nicians can titrate.

One comparison of techniques was made by evaporating a large quantity of water to concentrate the hardness. The titration method revealed 0.8 ppm; the colorimeter showed 0.6 ppm. A company engineer said the difference was negligible, but if it were important he would accept the analyzer as being more accurate due to elimination of the human element.

Manpower and training requirements will be lessened with the automatic colorimeters, judging by results to date. One supervisor can be responsible for overseeing a large battery of analyzer comparators. Little supervisor training is necessary. Even the company's instrument mechanics have not needed special instruction.

Equipment downtime is another area of anticipated improvement. Already the analyzer has spotted and corrected an unexpected condition. While operating at a large plant treating 2000 gpm of water, the colorimeter pinpointed a short cycle. Water from one of the softeners had become hard earlier than predicted.

By using the analyzer as a monitor, the softener causing leakage was spotted much sooner than it would have been normally. It might have taken an operator several hours to locate leakage by conventional manual-test methods.

Portability — The colorimeter is small and light in weight. But the chemical firm's water consultants do not recommend using it as a portable field-service unit unless it is specially modified.* The unit

*This modification is accomplished by making photoelectric portion of analyzer detachable and carrying it along with special indicators and buffers tailored to meet various conditions.

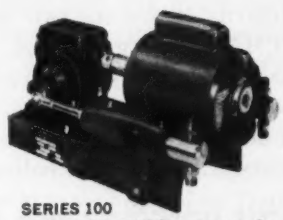
ACCURATE CHEMICAL FEEDING

from .65 gph to 1624 gph

SERIES 200
Self-contained lubricating system—no downtime for lubrication. E.Z. Clean Cartridge liquid end simplifies maintenance. Simplex models pump up to 812 gph at a maximum pressure of 10,000 psi. Duplex models double that capacity.

American controlled capacity proportioning pumps have repetitive metering accuracy of plus or minus 1%, when operating between 10% and 100% of capacity. Feed precisely metered fluids or slurries in virtually all ratios, with flow, temperature, pressure, conductivity, pH and other controlled process variables.

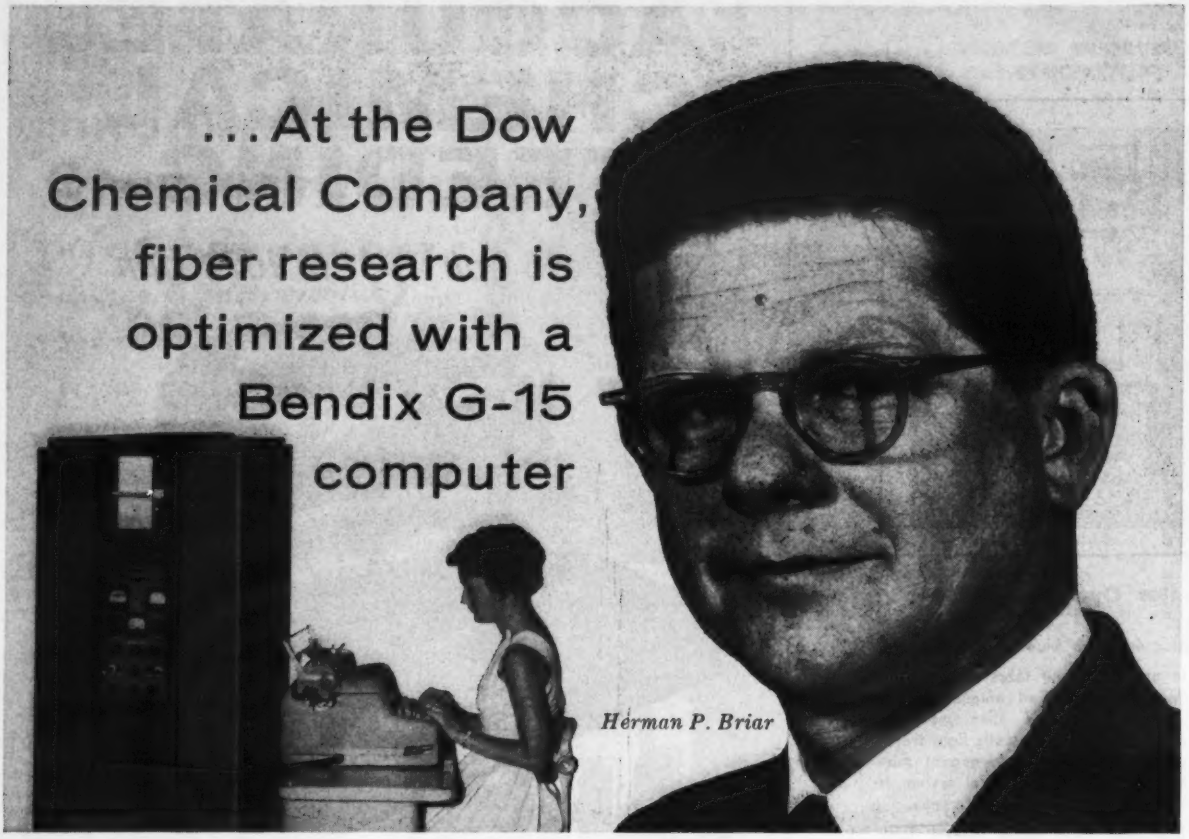
- interchangeable liquid ends
- spherical self-aligning bearings on crank and crosshead handle greater radial and axial thrust loads
- crossheads of hardened and ground steel ride on cast iron
- nylon dust covers protect bearing surfaces
- NEMA frame motors
- heavy duty reducers



SERIES 100
Simplex models pump up to 13.10 gph at a maximum pressure of 1000 psi. Duplex models double that capacity.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)
pump division
13500 PHILMONT AVE., PHILADELPHIA 16, PENNA.

Check 5006 opposite last page.



At Dow Chemical, Research Project Leader Herman P. Briar used the Bendix G-15 digital computer to speed research and reduce material costs in the development of the new synthetic fiber, *Zefran*. The versatility of the low-cost G-15 also permits its usage on other important Dow projects, including quality control, engineering, and market development.

More than 350 G-15's are currently in use, many in the chemical process industries. One reason for this popularity is that the new user, through the G-15 EXCHANGE Organization, may take advantage of the work already done in applying the G-15 to his type of work. For instance, in the chemical field, the new G-15 user would have access to a wide variety of programs including:

Process simulation • mass spectrometer calculations • pressure vessel design • column design • linear programming • probability analysis • statistical analysis • viscosity calculations • heat exchange calculations • information retrieval • regression coefficients • multiple linear regression • pipeline analysis • analysis of variance • numerical differentiation • quality control • random number generation • Fourier synthesis • and many more in engineering and business fields.

The G-15 has many other valuable features: very low price, the widest variety of standard accessory equipment of any computer, alphanumeric typewriter and paper tape input-output as standard equipment, simplified programming systems, nationwide service organization, and fast availability.

A Bendix Computer representative will be happy to discuss your computing needs in detail. Or, write for descriptive literature.

Bendix Computer Division
DEPT. G-22 LOS ANGELES 45, CALIF.

Bendix CORPORATION

Check 5007 opposite last page.

must be calibrated. This is an added chore when it is moving from one situation to another.

The analyzer is made to operate at 9.5 pH, which is achieved with a sensitive buffer that is a vital ingredient of the reagent. The reagent must be tailored to any other pH. The chemical company has found that such reagent balancing is beyond the scope of most technicians who are otherwise qualified to keep an eye on the unit's operation.

(Chemalyzer is product of Milton Roy Company, 1300 E. Mermaid Lane, Philadelphia 18, Pennsylvania.)

Check 5008 opposite last page.

Tape programming tabbed for chromatograph use

Uses: Process-stream analysis.

Features: Gas chromatograph utilizes tape programming for first time.

Description: Tape-programmed-gas chromatograph employs motor-driven transparent film in conjunction with photo-electric transmitter and receiver to achieve any combination of time and sequence required in process chromatography. Film is programmed by means of graphite markings spaced to interrupt photoelectric beam and effect such desired sequences as peak selection, range sensitivity, valve actuation, automatic zeroing of detector cell

Operator inspects programmed tape prior to insertion in chromatograph

and visual readout.

Repeatability of chromatograph approaches 0.1 sec. It incorporates dual-temperature zoning within analyzer housing. High-temperature zone has range of 120 to 450°F. It has constant heat supply and is insulated from, and located within, low-temperature zone, where temperatures can be held to 0.03°F.

Analyzer can accommodate two columns to 50′ each in length. Motor-operated valve allows columns to be operated independently or simultaneously in either direction, with option of using columns in series or parallel.

(Tape-programmed gas chromatograph is product of Mine Safety Appliances Company, Braddock Thomas and Meade Sts., Pittsburgh, Pa.)

Check 5009 opposite last page.

Varying v-meter accuracy brought to halt

Accuracy to 0.2 db or 2%, anywhere on 14″ three-cycle scale with AC or DC inputs, is reported for recently developed analog electronic voltmeter. A 70-db unit utilizes mirror scale and knife-edge pointer to eliminate parallax. Second manually adjustable db reference scale provides for any arbitrary 0-db reference.

Log-converter readout circuit with separate zero control and floated Zener reference may be used as source for conventional DC recorder for decibel recording. Multiple units may be used for division or multiplication before indication or recording.

Input impedance is 5 megohms (min) on AC or DC scales. Frequency response is flat to 0.25 db from 20 cps-50 kc on AC scale with full-wave average-value detection and rms indication. Extra damping is provided for range of 1 to 10 cps. With RF probe above 50 kc, voltmeter is peak-reading.

(Voltmeter HLV-150 is product of Houston Instrument Corporation, Box 22234, Houston 27, Texas.)

Check 5010 opposite last page.

accuracy

ASHCROFT DURAGAUGES measure pressure with precise accuracy no matter how severe the conditions of service

Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".

sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Movement of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe®" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.

MAXWELL MANNING MOORE INC. MM&M TRADE MARK

ASHCROFT PRESSURE GAUGES

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Check 5011 opposite last page.

So SIMPLE that "Specials" are Likely to be Standard!

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol

MAGNETROL

The World's Most Dependable

LIQUID LEVEL CONTROL

Because of the utter simplicity of Magnetrol's magnetic operating principle, standard models can be easily adapted to meet any special requirements for pressure, temperature or corrosive liquids . . . and usually at little extra cost. This Magnetrol versatility has solved all kinds of tough level control problems . . . and given our engineers wide application experience that can be invaluable to you.

Magnetrol is so simple that failure is all but impossible! Using only permanent, unfailing magnetic force for its operation, there's nothing to wear out . . . no diaphragms or bellows to stiffen and rupture . . . no electrodes to short or corrode . . . no packing to bind or leak. Magnetrol is practically maintenance-free! Magnetrol units are available for controlling level changes from .0025-in. to 150-ft. . . . with multi-stage switching when desired. Send coupon for full details.

MAGNETROL, Inc.

Send Coupon For Full Details

MAGNETROL, Inc., 2129 S. Marshall Blvd., Chicago 23, Illinois

Please send me catalog data and full information on Magnetrol Liquid Level Controls.

Name .....

Company .....

Address .....

City ..... Zone .... State .....

Check 5012 opposite last page.

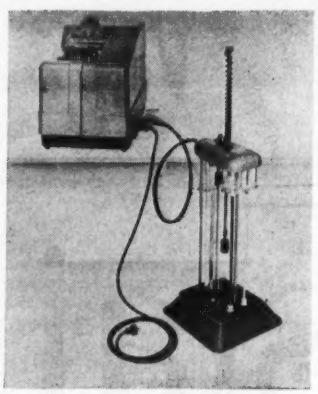
Trace solids in fluids automatically shown-up by detector

Millipore-filter test method used by analyzer

Automatic tape analyzer detects trace fluid impurities and indicates, by color variation, balance of ingredients in liquid and gaseous products.

Instrument employs Millipore filter test method. In this test, particulate material is quantitatively removed from liquid or gaseous sample by ultra-fine filter membrane. It is retained on filter surface where it may be identified, sized, counted or tested.

Analyzer measures 25¾ x 12¾ x 17". It weighs approximately 75 lb (with volume-measuring tank) and operates on single-phase 110-115 v 60 cy current. Flow rates are 0.1 to 0.5 gpm, and operating pressure is 50 to 100 psig.



Tape analyzer automates Millipore test by filtering sample in sequence as often as desired through nylon-backed tape of membrane, and printing time each sample is taken

(Automatic tape analyzer is product of Graver Water Conditioning Co., Division of Union Tank Car Company, 216 W. 14th St., New York 11, New York.)

Check 5013 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

TEL-TRU DIAL

THERMOMETERS

18-8 STAINLESS STEEL

Industrial

All popular Dial Ranges Fahrenheit or Centigrade

THREAD TYPE—Model GT-300R with recalibrater. Anti parallax dial avoids reading errors. Actuated by super sensitive bi-metallic helix coil—no liquids. Guaranteed accurate within 1% around entire dial range. Head diameter 3". Standard ½" N.P.T. stainless steel connecting nut. Stem 2½" to 72" long x .250" diameter. Measurements include thread. Also available without recalibrator as Model GT-300.

SEND FOR FREE LITERATURE
MANUFACTURER'S AGENTS WANTED

TEL-TRU MANUFACTURING CO.
251 St. Paul Street, Rochester, N.Y.

Subsidiary of Germanow-Simon Machine Co., Inc.

THREAD TYPE—Model GT-200. Head diam. 1¾". Standard ⅛" & ¼" N.P.T. stainless steel connection nut. Stem: 2½" to 18" long x .150 diam. Measurements include thread.

GENERAL TYPE—Model GT-100. Head diam. 1¾". Stem 5"-8" long x .142" & .150" diam. Adjustable vessel clasp. Manual preset indicator for marking temperature.

POCKET TYPE—Model PT-50, service man's spot check. Head diam. 1". Stem 5" long x .150 diam. Hard rubber pocket case.

Check 5014 opposite last page.

NOW

A LOW COST METERING

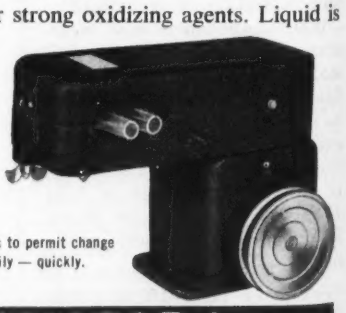
PUMP

FOR

SULPHURIC ACID

AND OTHER

STRONG OXIDIZING AGENTS Now a special formulation of Hypalon makes the dependable SIGMAMOTOR Pump applicable for metering sulphuric acid or other strong oxidizing agents. Liquid is forced through Hypalon tubing by wave-like action of steel fingers. Never contacts metal.



Model T6SH opens to permit change of tubing easily — quickly.

SIGMAMOTOR Inc.

18 NORTH MAIN STREET • MIDDLEPORT, NEW YORK

Check 5015 opposite last page.

THAT'S INTERESTING

Test for tutors

Automatic teaching machines resembling microfilm viewers in appearance, are undergoing a crucial test. Robot tutors will be used by group of Air Force trainees taking 15-week course in electronics.

Their results will be compared with those of two control groups.

Glass may best metals

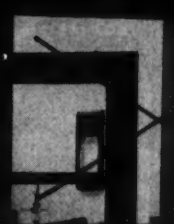
Soviet scientists reportedly have developed a technique for increasing the strength of glass by combined thermal and chemical treatment.

Experimental results suggest possible replacement of metals by glass as structural material, since bending strength of glass so-treated is greater than that of certain widely-used steels.

For more information on product at right, specify 5016 see information request blank opposite last page.

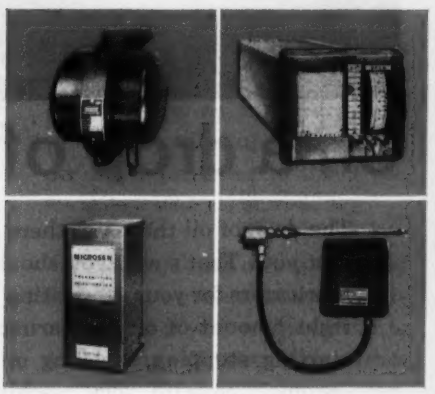
12:30 A.M.

Everything's under Control!



ROBERTSHAW MICROSEN

All's right at half after midnight.
The new shift settles in to monitor the processing steps. Meanwhile, out among the towers, Robertshaw-Microsen® Electronic Systems are providing maximum automation for data acquisition, transmission, recording and control of process variables. It's a typical job for Robertshaw—keeping everything under control. For greater system flexibility, lower initial investment and minimum operating costs—specify Robertshaw-Microsen for precision control of pressure, temperature, differential pressure, oxygen concentration, liquid level, gas analysis, pH, flow. Over 50 sales-service offices—write for address of the one nearest you—and for Technical Bulletin 10, entitled "Process Instrumentation."

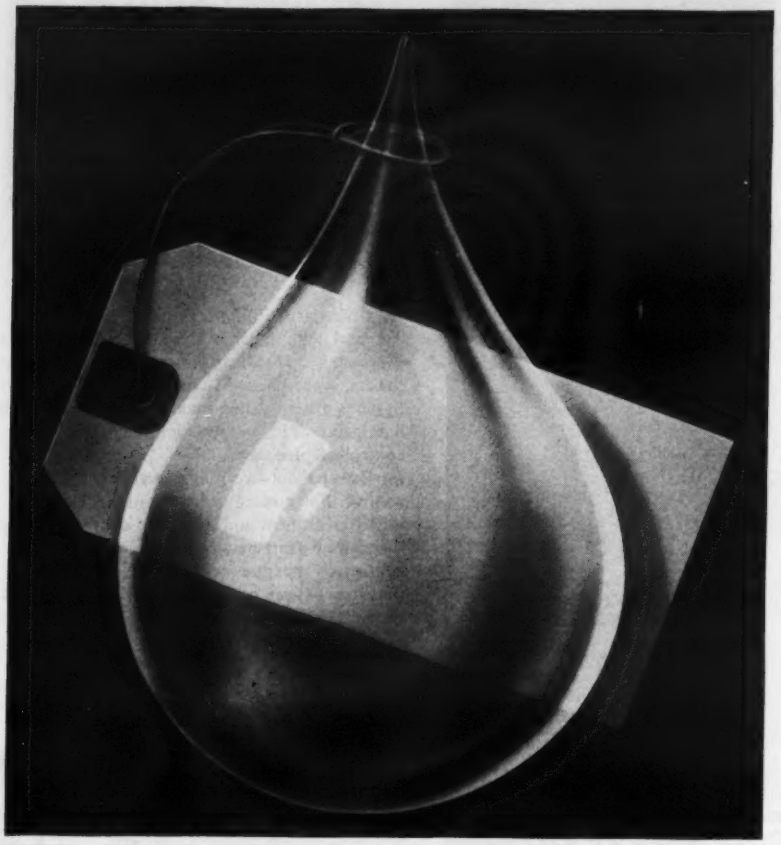


Shown above: (Top, l. to r.) Microsen Transmitter, Microsen Recording Controller. (Bottom) Microsen Transmitting Potentiometer, Level-Tek Level Detection and Control System.

Robertshaw

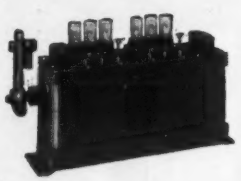
Aeronautical and Instrument Division
Robertshaw-Fulton Controls Company,
Santa Ana Freeway at Euclid Avenue
Anaheim, California

What's the PRICE TAG



on a drop of oil?

The drop of oil that isn't there when it's needed can really cost you! That's why you should choose Manzel force-feed lubricators for your lubricating needs. They deliver just the right amount of oil to bearings, cylinders and packing... starting, stopping, speeding up and slowing down in synchronization with your machinery. They're unaffected by high steam, gas or air pressure. Whatever your lubrication needs, Manzel lubricators can save you money. For our catalog, write Manzel, 251 Babcock Street, Buffalo 10, New York. You'll solve all your lubricating problems if you...



ask the man from

A UNIT OF HOUDAILLE INDUSTRIES, INC.

Manzel

SPECIALISTS IN LUBRICATORS AND METERING PUMPS SINCE 1898

Check 5017 opposite last page.

PROCESS INSTRUMENTATION and LABORATORY APPARATUS

Computer design dictated by process-control needs

Fully transistorized digital set-up bases its bid for closed-loop duty on strong design foundation, including direct acceptance of data from analog instrumentation . . . 8000 32-bit-word memory . . . and self-contained refrigeration system

A recent addition to the ever-growing family of digital-computing systems incorporates several design features certain to place it in the thick of process-control activities. It is capable of accepting data directly from analog instrumentation and of providing for closed-loop operation.

The system is adaptable to the entire range of process-control applications — including basic data-gathering and processing, use of computer-derived data to direct operator control of processes, and complete automatic direction and control of processes.

A voltage-to-digital converter is built-in. Converter is of the successive-approximation type. It has standard input ranges of 0-1 and 0-10v. Control outputs are from contact closures of mercury-wetted relays or voltage dividers made up of resistor matrices switched by the relays.

All computing elements except for input-output devices are sealed within an airtight enclosure. A self-contained refrigeration system in main cabinet maintains temperature and atmosphere at optimum levels. Sealed cabinet of system measures 48" wide, 28" deep and 71⅝" high.

Performance Characteristics

Heart of the process-control system is a fully transistorized two-address serial-binary digital computer. A 64-word recirculating register is used for input and output buffering and switching.

The system's memory is provided by an 8000-word shrouded magnetic drum. Drum operates at 3600 rpm. Typical command-execution time (including access) is four word periods, or roughly one millisec.

Dual-access heads and high-speed lines give system maximum memory search speed of 4000 words/sec, with average of 2000 to 3000 words/sec obtainable under optimum programming. Average main-storage access time is 8.5 millisec. Maximum time through high-speed line is 1.0 millisec. Memory search of 8000 words can be completed in 2½ to 4 sec.

Computer word length is 32

Process-control digital-computer system acts on both analog and digital input-output and has data-storage capacity of 8000 words of 32 bits each

A Computer Trendsetter?

Most digital-computer systems in use today in process-control applications are adaptations of units originally designed for general data-processing and/or computational work.

The system described here — tailored specifically for process duty — is therefore a definite departure from the norm. It is a strong testimonial of confidence in the future of computer control in the CPI.

bits, including one sign bit. This length permits inclusion of coded instruction, operand address and address of next instruction — all in single word space. Time and program steps are thus saved. Inclusion of command and two addresses on single storage location also permits storage of a full 8000-word program.

Tracks on drum are numbered from 0 to 127 and contain 64 words each. All timing depends on sector numbers only. Thus program may skip for instructions or operands independently of track numbers.

To adapt system for analysis and control of complex processes, 43 commands are employed. Programs can be changed to suit new operational conditions. Also, variety of commands gives flexibility of programming to conserve time and memory.

System design permits incorporation of various data-handling and processing equipment such as card readers and sorters, magnetic-tape storage, photoelectric readers and high-speed tape punches. High-speed read time for computer is 500 characters/sec.

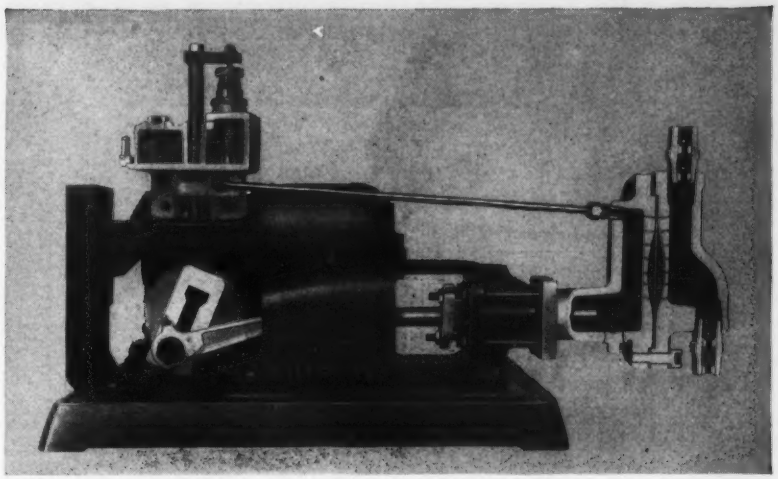
(Libratrol-1000 digital-computer system is product of Librascope Division, General Precision Inc., 808 Western Ave., Glendale 1, Calif.)

Check 5018 opposite last page.

how to meter corrosive liquids safely and accurately

THE problem of metering highly corrosive, toxic, or dangerous liquids can frequently be solved with a diaphragm type controlled volume pump. In this design, the plunger displaces a hydraulic fluid, which in turn moves the leakproof diaphragm to create pumping action through the ball checks.

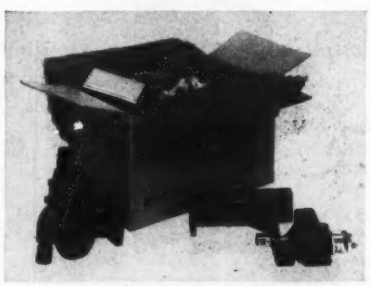
Isolating the plunger and drive from the process fluid solves the corrosion problem, but it introduces another problem—air binding—that must be overcome to assure accurate, dependable metering. Milton Roy eliminates the air binding problem by automatically and mechanically venting the pump chamber once each stroke.



Cross-section of Milton Roy diaphragm pump shows how positive mechanical venting compensates for minor variables, eliminates air-binding.

Air binding

The plunger, or hydraulic side of the diaphragm is essentially a *closed* system. An air bubble caught in this system contracts and expands with each stroke, destroying accuracy in proportion to the change in air bubble size. This "air binding" effect can reduce pumping efficiency to the point where pumping actually ceases!



This complete kit lets you convert any Milton Roy packed plunger MD pump to a diaphragm liquid end pump.

But that can't happen with a Milton Roy pump. For a brief period during each cycle, the reservoir ball check opens while the plunger reciprocates through a fraction of an inch without diaphragm motion. During the suction portion of the stroke, hydraulic fluid flows into the pump chamber to make up any losses. During the discharge portion, any excess fluid or air present is forced out of the system. This positive mechanical action not only eliminates air binding, but compensates for any minor variables which may affect pumping accuracy. Milton Roy takes the further precaution of isolating the hydraulic fluid from the drive train. There are no gears, worms, or trunnions beating air into the fluid.

Interchangeability

Any Milton Roy MD pump can be equipped with a diaphragm liquid end quickly and easily. A kit is available with all necessary parts and instructions. It's the ideal way to modernize your packed plunger pumps to keep pace with changing process requirements. Diaphragm liquid ends are available in steel, 316 SS, Milroy* SS, plastic, and special sulfuric acid construction. Diaphragms are either Teflon (standard), or 316 SS for process temperatures above 350 F. Complete pumps or conversion kits provide capacities up to 224 gallons per hour, pressures to 2,500 psi.

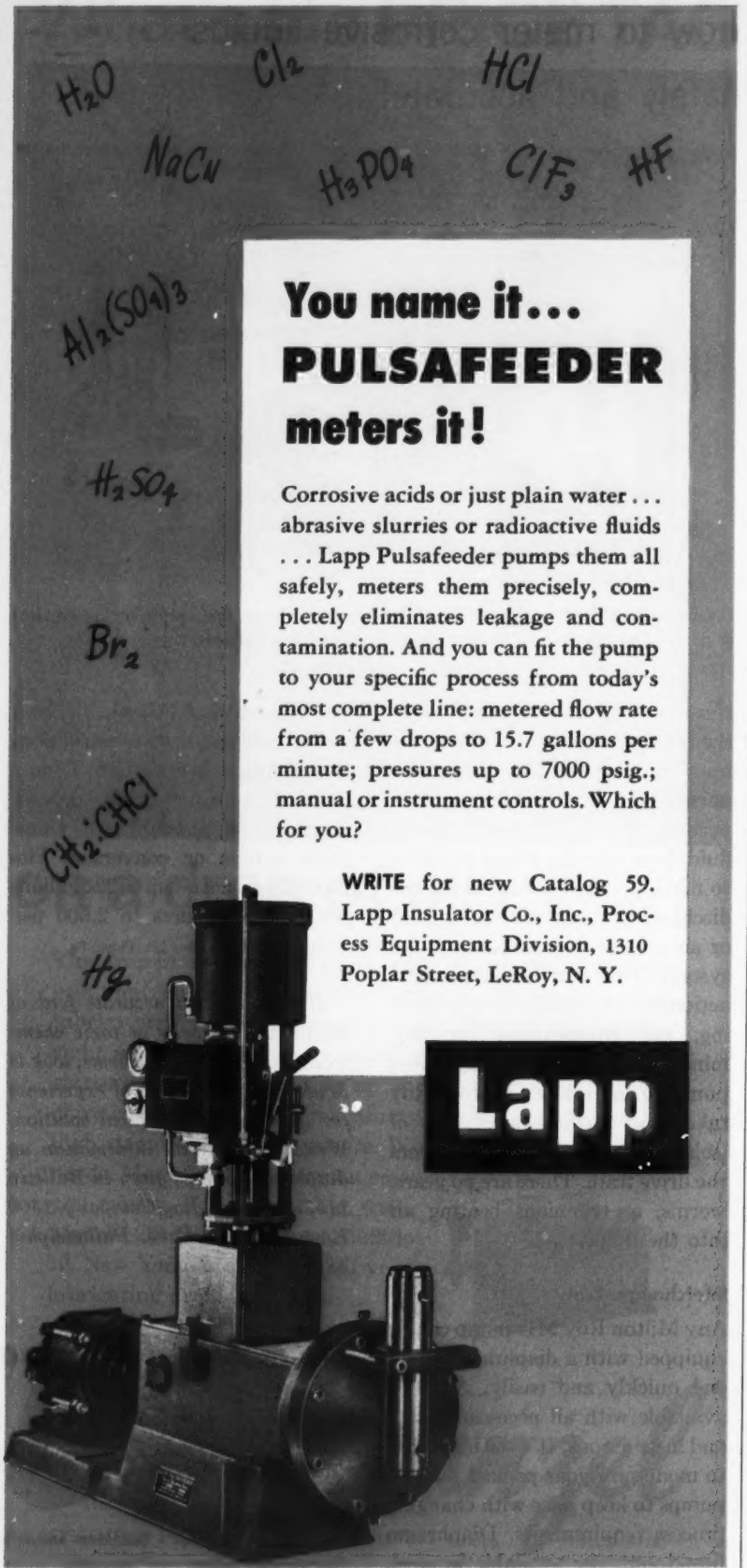
*Tradename of Milton Roy Co., Phila., Pa.

If the safe and accurate feed of hazardous, corrosive or toxic chemicals is one of your problems, look to Milton Roy's 25 years of experience for your most economical solution. Write for complete information on diaphragm pumps given in Bulletin 1157-3. Milton Roy Company, 1300 East Mermaid Lane, Philadelphia 18, Pennsylvania.

milton Roy
CHEMICAL INSTRUMENTATION SYSTEMS

Controlled Volume Pumps • Quantichem Analyzers
Chemical Feed Systems • pH Instruments

Check 5019 opposite last page.



You name it... PULSAFEEDER meters it!

Corrosive acids or just plain water . . . abrasive slurries or radioactive fluids . . . Lapp Pulsafeeder pumps them all safely, meters them precisely, completely eliminates leakage and contamination. And you can fit the pump to your specific process from today's most complete line: metered flow rate from a few drops to 15.7 gallons per minute; pressures up to 7000 psig.; manual or instrument controls. Which for you?

WRITE for new Catalog 59. Lapp Insulator Co., Inc., Process Equipment Division, 1310 Poplar Street, LeRoy, N. Y.

Lapp

Check 5020 opposite last page.

Complete cascade control housed in single unit

A remote-control cascade station contains all panel-mounted components needed for pneumatic cascade control of a process.

Station makes use of two controllers. It receives measurement from two different points in process, recording them on same chart. Output of primary controller pneumatically adjusts set point of secondary controller. This output, in turn, operates valve.

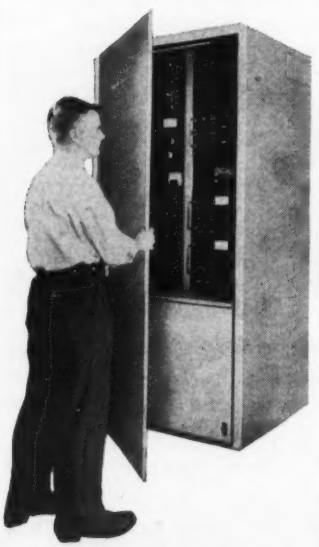
(Cascade control station is product of The Foxboro Company, Foxboro, Mass.)

Check 5021 opposite last page.

X-ray unit opens the door to multi-element analysis of continuous flow

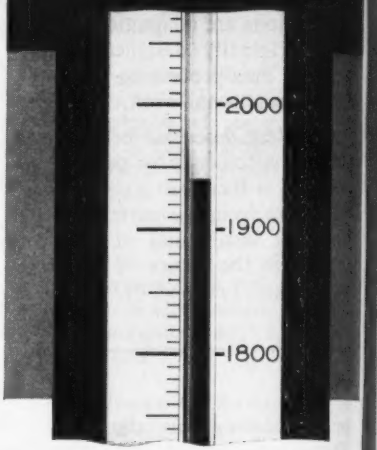
Multi-element analysis of materials in a continuous flow —never before possible—has been born with successful application of X-ray emission gage for this purpose.

This instrument simultaneously and continuously checks presence and amount of as many five elements with reference (six without reference), from aluminum up



Development of multi-element X-ray analyzer for continuous stream analysis has added a new facet to process measurement

MEASURE BULK LIQUIDS with *The King-Gage*



Gain Accuracy, Save Time, Eliminate Risk or Doubt

With the King-Gage, you can measure the *weight, depth* or *volume* of *any* liquid in *any* storage or processing vessel - - quickly, safely and accurately, from any desired location.

Throughout industry, King-Gages are guarding against shortages, errors in receipts and deliveries, inaccuracy in mixing and formulating, and losses in processing. They eliminate the hazards of climbing on tanks; and in man-hour savings alone, they often pay for themselves in 6 to 12 months.

King-Gages work as a frictionless balance, with no wearing parts - - operate on the U-tube principle, whose accuracy is inherent. They measure continuously and are read at a glance. Scales are graduated in any units desired.

Serviced Locally. There's a King-Gage distributor near you, factory-trained to discuss application details and to give prompt service whenever needed. You can depend on him.

KING-GAGE CATALOG 1010 gives further details; shows many applications. Write for it.

KING ENGINEERING CORP.
3207 S. State St. Ann Arbor, Mich.
DISTRIBUTORS IN 26 PRINCIPAL INDUSTRIAL CITIES

Check 5022 opposite last page.

through periodic table. It provides graphic, on-line analysis of material's composition — whether in form of liquid, slurry or solid — as dry or moist powders or sheets. Individual samples can also be analyzed.

Gage consists of two major components: measuring head and electronic-control cabinet. Head houses and mounts X-ray tube and incorporates collimation slits, analyzing crystals, counter tubes and preamplifiers for analyses. Control cabinet houses and mounts all power and measuring components.

(X-ray emission gage is product of X-Ray Department, General Electric Company, 4855 W. Electric Ave., Milwaukee 1, Wis.)

Check 5023 opposite last page.

Contents are not secret in small mixer

Uses: Mixing small amounts of products in laboratories.

Features: Chamber of mixer is constructed of clear plastic for observation purposes. It is instantly removable for mounting.

Description: Mixer chamber

Mixer chamber is constructed of clear plastic

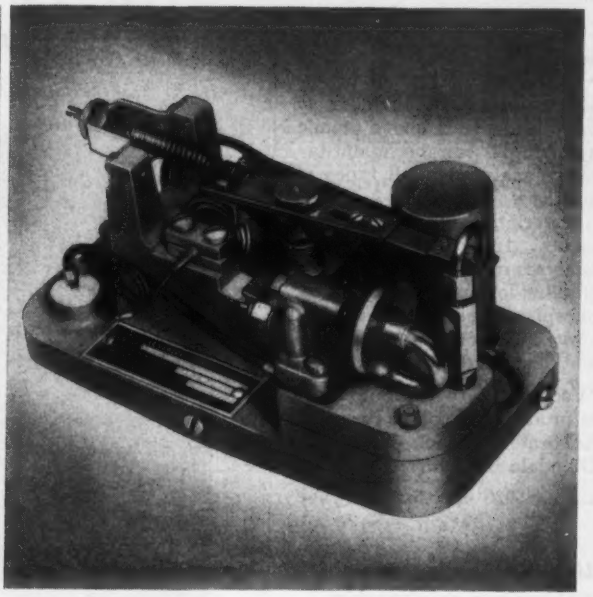
rotates in two changing planes simultaneously. Dimensions of chamber are 6½" diam by 12" long.

(Rotomixer is product of Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N.Y.)

Check 5024 opposite last page.

The compact SENSAIRE Transmitter *measures only 7¾" x 4¾" x 4¼". Weighs only 7 lbs. Suitable for many types of application.*

Interchangeable, all-welded thermal system. *Bi-Metal case compensation. Especially desirable on low temperature applications and where mercury is not acceptable.*

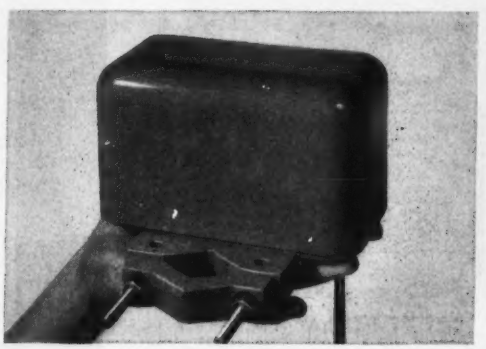


New from Taylor... **GAS-ACTUATED SENSAIRE* TRANSMITTER**

This new version of the time-proven SENSAIRE Transmitter makes low-cost temperature measurement available for those applications where mercury actuation is not acceptable. A force-balance type transmitter, No. 202TG is compact, sturdy and extremely dependable. Adjustments are simplified; repeatability is excellent.

- **Available in 3 range spans.** 100°F., within limits of minus 400°F. to +300°F.; 200° and 400°F, within limits of minus 400°F. to +1000°F.
- **Maximum overrange protection**—100% of range span above operating range.
- **Calibration accuracy** within 1% of range span below 550°F.; 1½% above 550°.
- **Ambient case temperature limits**—minus 30° to +150°F.
- **Air supply**—20 psi recommended; 25 psi maximum.
- **Air consumption**—0.4 scfm.
- **Bulb size**—11/16" x 5⅛". (Optional capillary bulb gives temperature averaging effect. Permits variable immersion with no loss of accuracy.)

Ask your Taylor Field Engineer, or write for **Bulletin 98293.** Taylor Instrument Companies, Rochester 1, New York, and Toronto, Canada.



Easy to install. *Mounts in any position. Universal bracket provides for direct mounting on pipe, wall or wrench head of well or separable bushing.*

*Trade-Mark

Taylor Instruments **MEAN ACCURACY FIRST**

Check 5025 opposite last page.

Rapid atomic analyses in evacuated chamber

Uses: Atomic analyses of nearly all elements.

Features: Instrument incorporates evacuated chamber so that all elements above atomic number 11 can be quantitatively analyzed in all types of matrices.

Description: X-ray spectrometer gives vacuum X-ray analyses of many elements including low concentrations of phosphorus, sulfur and silicon. Unit incorporates both fixed and scanning spectrometers.

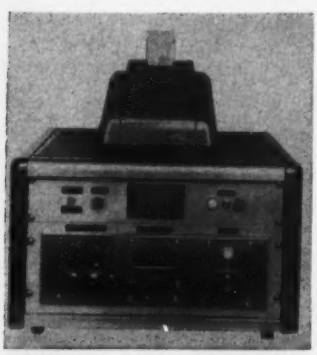
(Vacuum X-ray Quantometer is product of Applied Research Laboratories, Inc., Box 1710, Glendale 5, Calif.)

Check 5026 opposite last page.

Liquid-propellant weighing determines relationship for flowmeter calibration

Printout given every second for comparison curve

Uses: For liquid-propellant storage-tank installations, to 1) weigh fuel stored in tanks and 2) determine weight versus time-flow relationship for accurate calibration of flow-meter transducers.



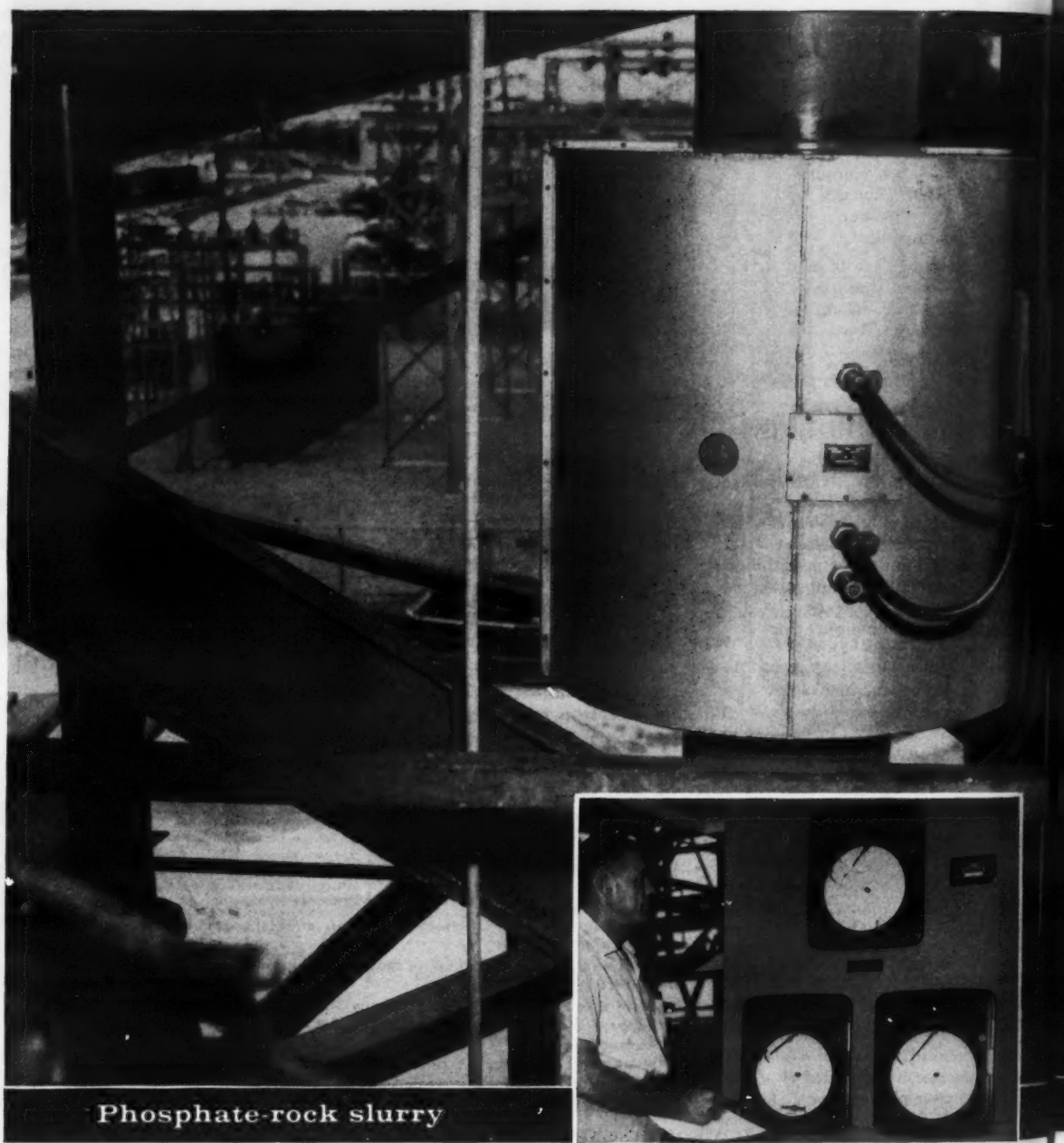
Weighing system for liquid-propellant storage-tank installations weighs fuels stored in tanks and determines weight versus time-flow relationship for accurate calibration of flow-meter transducers

Features: Printout is provided every second.

Description: Printout of unit permits sufficient number of points to accurately determine

at International Minerals –

sand, acid, rock . . . nothing stop



This 16" Foxboro Magnetic Flow Meter is part of a mass-flow system for measuring phosphate rock slurry pumped to flotation plant. Meter measures slurry in gpm, while nearby gamma ray density cell measures density of solution. The two variables are recorded separately, and their product is then recorded in dry-tons-per-minute on the third Dynalog instrument on the panel above. Recorder readings are telemetered to mine head so operators will know how much rock to feed into pipeline.

The Foxboro Magnetic Flow Meter

"One meter even paid for itself in 4 months" –

reports J. H. Andrews, senior development engineer

You'd travel a long way to find a process with as many meter-killing liquids as at International Minerals and Chemicals Corp., Bartow, Florida. Phosphate-rock slurries, sand-water slurries, phosphoric acid — yet they're all metered accurately, continuously with Foxboro Magnetic Flow Meters.

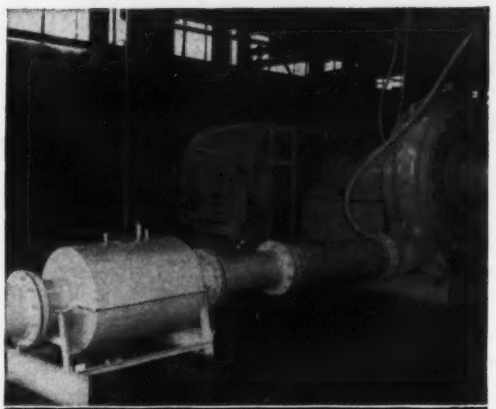
The Magnetic Meter is perfect for such "difficult liquids." It has no flow restrictions of any type — nothing to plug up. Instead, electrodes flush-mounted in corrosion-proof meter wall sense flow rate magnetically — send a linear proportional signal to a Foxboro Dynalog* Electronic receiver.

Magnetic Meters are installed as simply as a length of pipe — require no special meter runs, or straightening vanes. Maintenance is virtually nonexistent.

Ask your Foxboro Field Engineer for full details on the high-accuracy, low maintenance Magnetic Flow Meter. The Foxboro Company, 8110 Neponset Ave., Foxboro, Mass.

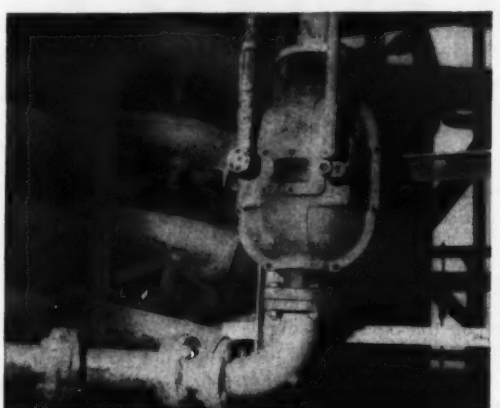
*Reg. U. S. Pat. Off.

Write for Bulletin 20-14.



Sand-water slurry

International Minerals uses this 12" Foxboro Magnetic Flow Meter to control pumping rate of sand and water slurry. Foxboro Dynalog Controller holds pump discharge within ±1% of its 6000 gpm capacity. Slurry is so abrasive, entire pump unit must be replaced every six weeks. Only work done on Magnetic Meter, however, has been one "preventive maintenance" liner replacement during 3 years of continuous operation.



Phosphoric acid

One of six Foxboro 3" Magnetic Flow Meters at International's Bonnie Chemical Works. Meters measure phosphoric acid with better than ±1% accuracy. Although meters have been operating up to 4 years, under highly corrosive conditions, none have ever required maintenance.

FOXBORO
REG. U. S. PAT. OFF.

Check 5027 opposite last page.

curve of weight flow versus time. Checking this against flowmeter output results in calibration curve for any particular flowmeter.

Data is picked up instantaneously with servo running. Only error in system is lag of servo behind true weight. To calibrate weighing system, a calibrated load cell is provided. By placing calibrated cell in series with system load cell, sight calibration can be accomplished by loading and reading.

(Weighing system 176-A is product of Gilmore Industries, Inc., 13015 Woodland Ave., Cleveland 20, Ohio.)

Check 5028 opposite last page.

Dial thermometer is easy to read

Uses: For duct installations involving air conditioning, for freezers, storage compartments, constant temperature rooms and boiler stacks.

Features: Dial thermometer features ease of reading and dependable accuracy throughout operating range. Stainless steel system provides quick response and long life.

Description: Dial thermometer has a 10-12" sensitive steel bulb with union flange connection. Gage is enclosed in aluminum case with chrome-plated slip ring. It is also available with fully compensated line up to 200' in length. Dials range up to 8" in size and temperatures to 800°F, according to model. Thermometer is actuated by mercury.

(Dial thermometer is product of Weksler Instruments Corporation, Freeport, N.Y.)

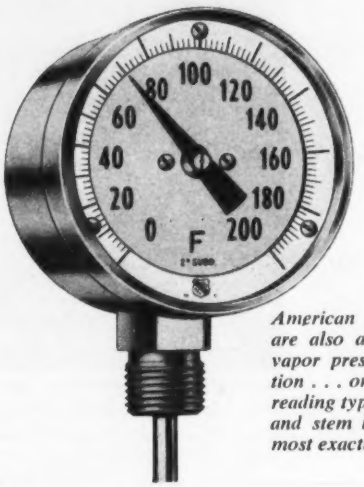
Check 5029 opposite last page.

NEXT MONTH

Uninterrupted distribution of 50,000 gpm of salt-water coolant is being deftly handled by a clever control system at Chas. Pfizer's Groton, Connecticut, plant. Readers of this Section next month will see the exclusive story on the installation.

sharp

AMERICAN BI-METAL THERMOMETERS make accurate temperature readings sharp and sure at all check points



American Dial Thermometers are also available in mercury, vapor pressure, and gas actuation . . . on-the-spot and distant reading types . . . in sizes, ranges and stem lengths to meet your most exacting requirements.

sensitive

Any way you look at an American Bi-Metal Thermometer, you see exact working temperatures.

The two-level "Maxivision®" dial eliminates parallax effects. Numerals are on the lower level. Graduations are on the outer raised ring dial which presents a sheared edge to the tip of the pointer and in the same plane. To make readability even more accurate, the glass and graduated dial are closely spaced.

American Bi-Metal Thermometers are made of weather-proof stainless steel. All joints are welded to solid unity, then polished smooth so corrosion won't build up and destroy the thermometer's usefulness. And, you don't have to discard this thermometer even if the glass is ever broken. The bayonet lock bezel makes replacement easy.

Learn about the high sustained accuracy and long service life built into American Bi-Metal Thermometers. Phone your nearby industrial supply distributor for help in selecting the right type for each temperature check point in your plant. Or write for Catalog 100A.

MAXWELL MM&M MANNING & MOORE INC. TRADE MARK

AMERICAN INDUSTRIAL THERMOMETERS

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Check 5030 opposite last page.

NEW LITERATURE

Process Instrumentation and Laboratory Apparatus

Non-destructive-test equipment is covered in 12-page booklet, containing engineering facts and specifications for many X-ray test units for radiography and fluoroscopy. Non-destructive Test Equipment Bul—Philips Electronic Instruments, Division of Philips Electronics and Pharmaceutical Industries Corp.

Check 5031 opposite last page.

Desk-top computer for statistical quality-control work is featured on single-sheet Tech Bul 91436—Boonshaft and Fuchs Inc.

Check 5032 opposite last page.

Magnetic-core-memory line is topic of eight-page brochure incorporating performance specifications and illustrations of several different models. Dimensions of each memory are shown, and discussion of data insertion (clear and write) and data extraction (read and regenerate) cycles and block diagram of typical system are included. Magnetic-core Memory Brochure—Computer Control Co., Inc.

Check 5033 opposite last page.

Max ultraviolet and infrared transmittance of 26 solvents is shown on 14″x17″ Spectroquality Solvents Chart—Matheson, Coleman & Bell Division, The Matheson Company, Inc.

Check 5034 opposite last page.

Oscillograph case-history descriptions of various applications are included in 36-page Visicorder Applications Bul—Heiland Division, Minneapolis-Honeywell Regulator Co.

Check 5035 opposite last page.

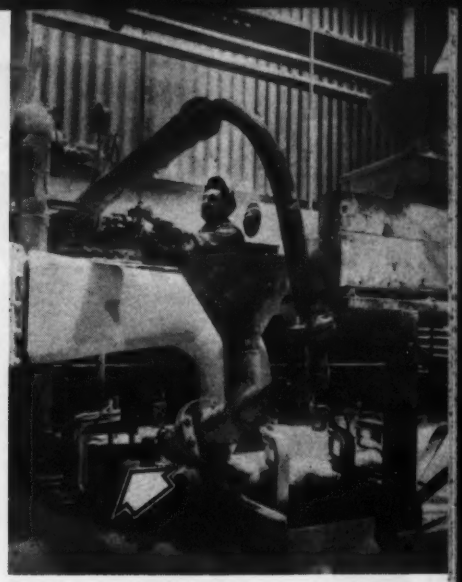
Spectral data sheets on organic compounds are being compiled by the Carnegie Institute of Technology through a project sponsored by the MCA. Initial issue is now available. It contains ultraviolet, infrared and mass-spectral data. Later issues, to be made available at six-month intervals, will contain Raman and nuclear-magnetic-resonance spectral data also. The data on physical and spectral properties are compiled to help industrial laboratories identify processing fractions as well as pure compounds.

Copies of spectral data sheets are available on an annual subscription basis at $0.10 each. Physical and themal dynamic data sheets are $0.05 each. They may be obtained from Manufacturing Chemists' Association, Inc., 1825 Connecticut Ave., N.W., Washington 9, D.C.

Operating on a continuous, around-the-clock basis — giant 42"-diam jet mills at New Jersey Zinc . . .

Smash TiO_2 down to ¼ micron on tonnage basis

Consistent, more complete disintegration enhances pigment's dispersibility, gloss and hiding power properties



Coarse titanium dioxide is fed into top of 42"-diam fluid energy mill through venturi opening (center foreground). Main steam supply enters mill through jets located inside header (arrow) around mill periphery. Some steam is diverted into end of feeder to help boost velocity of particles entering mill

Finer and more uniform grinds of TiO_2 pigment — at rates up to six tons per hour — are being produced by use of two giant fluid energy mills at the Gloucester, N. J., plant of The New Jersey Zinc Company. Reported to be largest of their kind, the 42"-diam machines can turn out product as fine as a quarter micron on a 24-hour-per-day basis.

The first mill was installed in 1959. It enabled plant to produce almost twice as much material as it previously did with two smaller units. The second machine went into service the early part of this year. Depending upon type of pigment being processed and fineness desired, each can handle up to three tons per hour.

Superheated steam is used by the mills as grinding fluid. Pressures range from 100 to 500 psi, temperatures up to 800°F.

Dry, coarse titanium dioxide particles are fed into the mill's shallow, circular grinding chamber through feed venturi opening located near the periphery. Tangential jet orifices, equally spaced around grinding chamber's wall, serve as entry points for the steam.

Reduction by Interimpaction

Steam rushing into grinding chamber causes violent rotation of product inside the unit. Individual TiO_2 particles smash into one another — interimpaction resulting in size reduction. Centrifugal force flings coarse particles against chamber's periphery, causing additional pulverization to occur.

Fine particles are carried out with steam through exit in center of unit. Steam and product are then separated by means of cyclones. Collected material is ready for bagging. (The company has found that fluid energy grinding also simplifies storage. The finer-ground material occupies less space than product produced by conventional mills.)

Approximately 55% of the plant's Horse Head brand pigment production goes to paint industry, 45% to paper, rubber, plastics, floor coverings and other firms. The material's uniform small size improves dispersibility, gloss and hiding power properties — all of which are important to paint formulators and paper coating manufacturers.

Preliminary Treatment

Prior to the fine grinding step, the titanium dioxide undergoes extensive processing. The incoming ore must first be dried, ground and digested in sulfuric acid. After clarification and evaporation, the material is precipitated, filtered, bleached and refiltered.

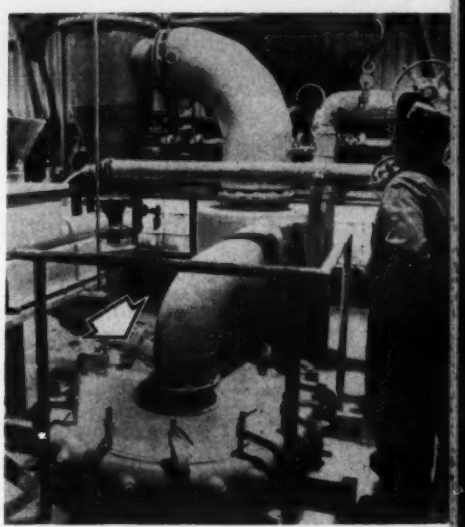
Product is then dewatered, calcined and cooled. The plant produces a number of anatase and rutile types of pigments.

After cooling, some products are dry-milled and packed immediately. Others undergo further classification and refinement. The latter are the ones processed through the fluid grinding mills.

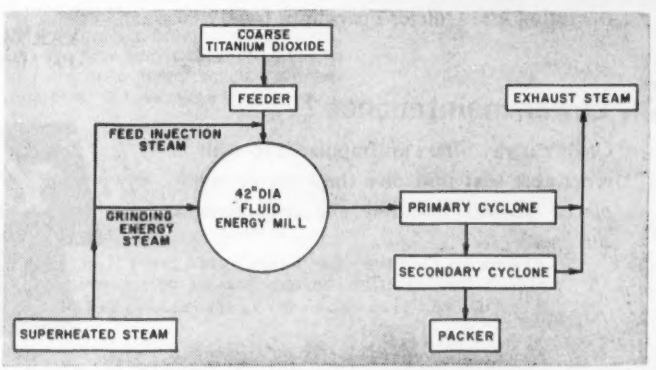
In addition to the two 42"-diam units, the plant has a 30" and 36" machine operating. The first of these was installed about five years ago. In all the units, particle uniformity is achieved by adjusting feed rate and/or rate of grinding fluid. These factors control rate and violence of interimpaction and, ultimately, particle size.

(Micronizer fluid energy grinding mills are product of Sturtevant Mill Company, Dorchester, Boston, Mass.)

Check 5036 opposite last page.

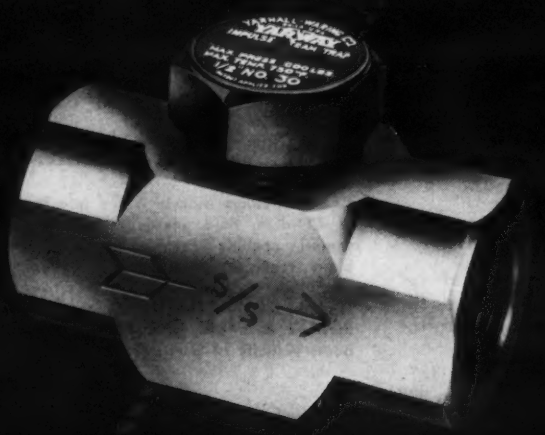


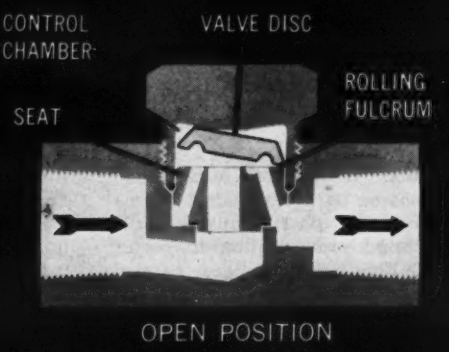
Fines and steam are vented through big line coming out of center of mill. Separation is conducted in cyclone system at rear. (Arrow points to line feeding steam into mill header)



Simplified flow diagram of mill installation

Do your steam traps give you these 3 advantages?





1. Economy of operation on light loads?

The Yarway No. 30 gives you closer control—discharges condensate at full capacity, closes immediately on steam.

2. Longer service life?

Yarway's lever action reduces impact on valve seat—lessens wear, gives longer operating life. Quieter operation, too!

3. Lower maintenance?

Only Yarway offers an Impulse trap with renewable seat and disc that *can be replaced without removing the trap from the line.*

Why settle for less? Get all three money-saving advantages with Yarway No. 30—plus these time-proven advantages of all Yarway Impulse traps: quick heat-up, even temperatures, small size, stainless steel construction, non-freezing.

Nearly 1,300,000 Yarway Impulse traps already installed. Stocked and sold by 270 Industrial Distributors. Ask *your* distributor to arrange a free 90-day trial in your plant. Or write us.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.

YARWAY
A MARK OF QUALITY IN STEAM ENGINEERING

Check 5037 opposite last page.

Up to 180 gpm handled by nine-inch diam pulp cleaner

An economical and practical pulp cleaner has been announced. Designed for use on high-grade paper machines, device has nine-inch head diam and capacity of 180 gpm. Pressure drop across cleaner is 50 psi.

(No. 609 Centri-Cleaner is product of Bauer Bros. Co. Springfield, Ohio.)

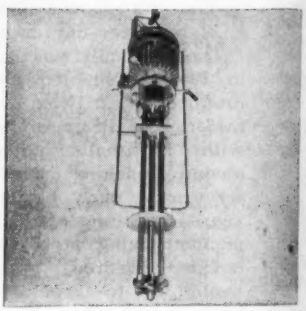
Check 5038 opposite last page.

Mixer converts in seconds from closed to open turbine model

Single unit has broad range of application

Uses: Mixing, blending, dispersing and homogenizing various materials.

Features: Unit can be converted in seconds from closed



Dual application mixer can process highly viscous and thixotropic products

to open-turbine mixer, providing dual application for single unit.

Description: Mixers draw material being processed from below and force it upward through restricted jet openings of mixing head without forming vortex or pulling air into product. Laboratory models have shaft speeds up to 8000 rpm. Production units are rated at 3600 rpm.

Distance between rotor and stator may be changed to adjust degree of shear and impact. Excessively viscous, gelatinous or highly thixotropic product can be processed by

removing stator sleeve and operating mixer as open-turbine unit.

Sizes range from ¼ to 15 hp, with mixing capacities from three to 3000 gal.

(Further information about Barrington convertible jet mixers may be obtained from Barrington Industries, Inc., 185 Union Avenue, Providence, Rhode Island.)

Check 5039 opposite last page.

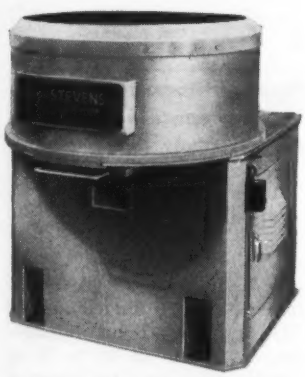
Compact muller occupies only seven sq ft

Mixes 400 lb batch in less than minute

Uses: Mixing wide variety of dry and semi-dry materials in chemical, food and allied industries.

Features: Machine stands only four feet high and can mix a 400 lb charge in less than one minute.

Description: Muller is designed for fast, economical and efficient operation. Compact unit occupies only seven



Muller's low silhouette makes it easy to load. Unit stands only four feet high

square feet of floor space. Low silhoutte makes it easy to load. Machine is designed for heavy-duty service and simple maintenance.

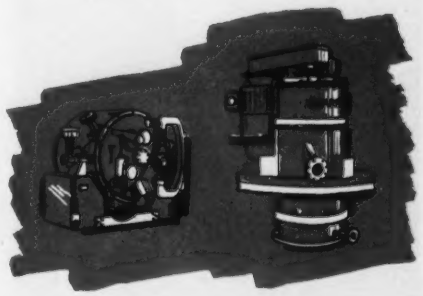
(Further information about the Stevens Muller can be obtained from Frederic B. Stevens, Inc., 1800 — 18th Street, Detroit 16, Michigan.)

Check 5040 opposite last page.

• the requirements are different–

so are the SHARPLES CENTRIFUGES designed to handle them...

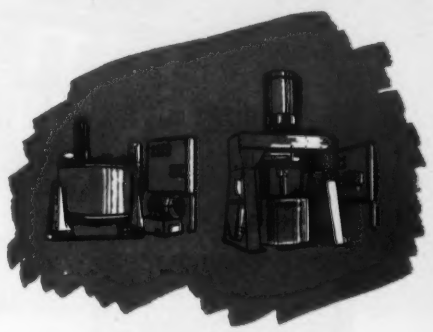
FINE, SLOW DRAINING CRYSTALS AND AMORPHOUS SOLIDS



In many plants today, pressurized models of the Super-D-Hydrator are proving the big difference in deliquifying and multiple washing of such high purity materials as the polyolefins. In addition, the vertical P-4000 puts all of the high performances of the Super-D-Canter at your control . . . plus operation in a pressurized system.

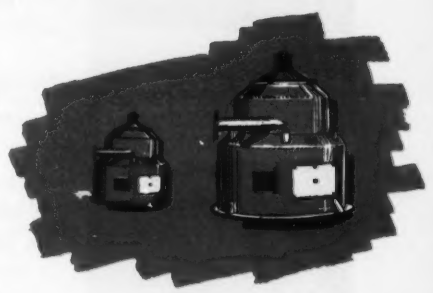
These two centrifuges are pacing the chemical industry with innovations that are tuned to advanced processing systems.

FRAGILE, FRIABLE CRYSTALS



Boric acid, sodium sesquicarbonate, aspirin . . . typical of the crystals that often must be "babied" as they are deliquified and rinsed to high purity in Fletcher automatic batch type centrifuges . . . with complete control of process variations. Two types with with wide choice of drives, speed ranges, and basket capacities from 1 to 16 cu./ft. The new Fletchers are leading the way with outstanding performance and tonnage production.

LARGE, FREE DRAINING CRYSTALS



The Super Conejector is especially designed for dewatering of fibrous pulps and medium-to-coarse solids at high capacity to 70 tons/hr. or more.

A wide range of controllable variables assures process flexibility which marks this Sharples centrifuge as a natural for many types of solids which are otherwise difficult to process efficiently.

Sharples has the line of centrifuges which offers broad diversification, and from which we can recommend the type and size best suited to your particular requirements. If you are deliquifying solids, take advantage of this specialization by Sharples. We welcome your inquiry.

THE SHARPLES CORPORATION

Centrifugal and Process Engineers

2300 WESTMORELAND STREET / PHILADELPHIA 40, PENNSYLVANIA

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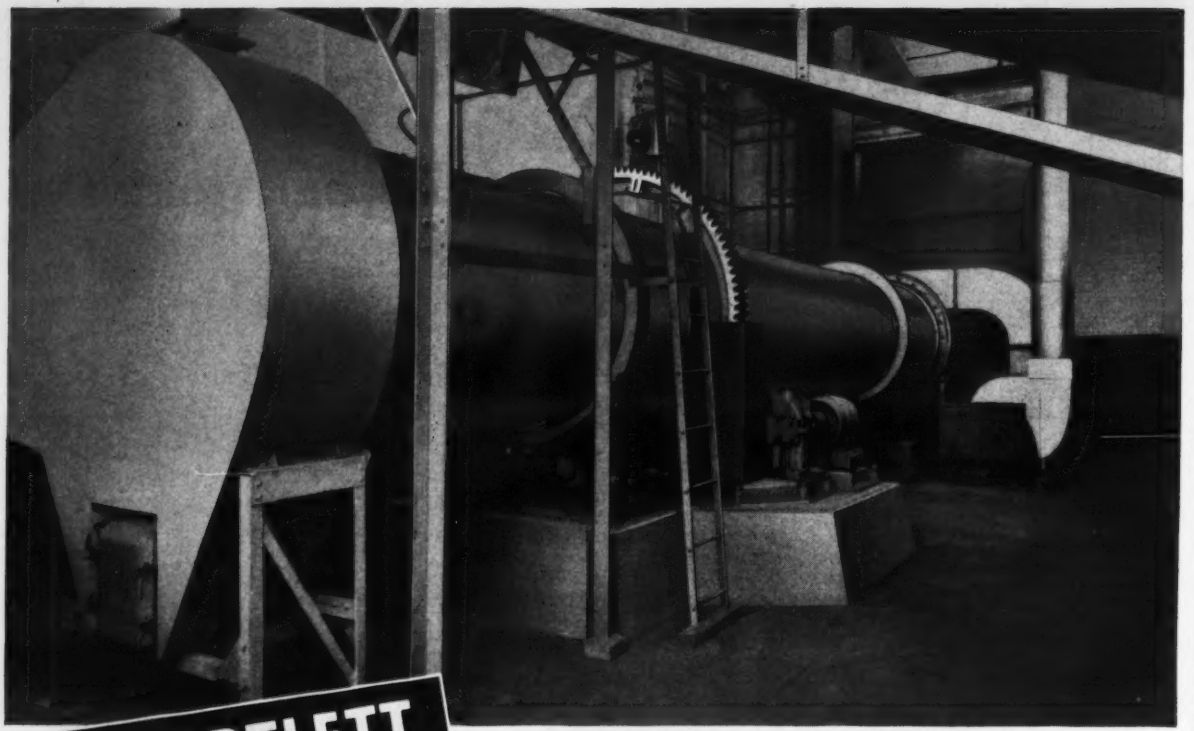
Check 5041 opposite last page.



BARTLETT-SNOW
CLEVELAND 5, OHIO

ROTARY DRYERS

Indirect Steam Heated Dryer Processing a Plastic Material.

Indirect Heated Style "D" Dryer Processing Carbon Black.

Widely used for drying chemical salts, ores, carbon black, metallic oxides, pigments, plastics, fertilizers, catalysts, pharmaceuticals, clays and many other materials and products.

Parallel and counter-flow dryers; direct heat, indirect heat, indirect-direct heat and steam tube types including the one *best suited for your particular requirement.*

Complete laboratory facilities enable us to determine the retention time, permissible temperature, preferred velocities, and all other performance data for any treatment. We can even produce samples of the finished product before the production unit is built.

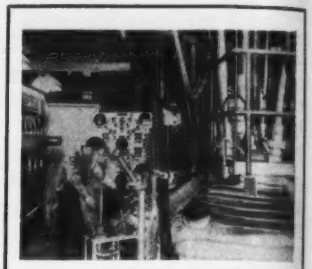
Our exacting design and fabrication assure accurately controlled product uniformity, and efficient, low cost, maintenance-free operation year after year, fully up to rated capacity. You'll find it pays to call the Bartlett-Snow heat processing engineers. Let us work with *you* on *your* next project!

Bulletin No. 118 gives full details. Send for a copy Today.

DESIGNERS
ENGINEERS
FABRICATORS
ERECTORS

THE C. O. BARTLETT & SNOW CO.
6150 Harvard Ave., Cleveland 5, Ohio
DRYERS • COOLERS • CALCINERS • KILNS

Check 5042 opposite last page.



Helium-cooled furnace

. . . is designed for safe handling of reactive metals. The gas cooling system replaces hazardous water cooling set-up normally used in conventional furnaces. Single pours of titanium up to 800 lb are believed to be possible with the unit. Furnace combines advantages of skull melting by permanent electrode with vacuum melting by consumable electrode. Device is also being used to test new melting techniques and study melting and casting of other refractory and reactive metals and alloys.
(Helium-cooled furnace was developed by National Research Corporation, 70 Memorial Drive, Cambridge 42, Mass.)

Check 5043 opp. last page.

Through-floor operation reduces space needs for dissolver

Drive assembly, tank can be on different levels

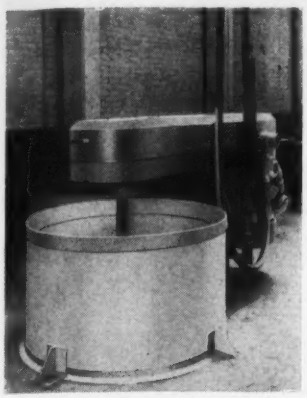
Valuable savings in floor space can be realized by use of recently announced "Through-the floor" dissolvers. Available in 40 to 75 hp sizes, units may be mounted on upper floors, walkways and balconies. Such locations permit the impeller to extend through floor and operate in tanks installed on lower level.

Design permits extensive use of gravity for transferring materials and simplifies pipe arrangements.

Dissolvers are equipped with hydraulic lifts. Device allows mixing mechanism to be raised as much as 66" to clear tanks.

Drive system is capable of delivering over 90% of motor

horsepower to impeller, even at slowest speeds. Impeller can be swung in 270° arc, permitting use of multiple



Dissolver's impeller extends through floor to tank on lower level. Large cylinder surrounding shaft is for safety purposes only

tanks. Impeller speed may be changed at any time without stopping the unit.

(Dissolvers are product of Morehouse-Cowles, Inc., 1150 San Fernando Road, Los Angeles 65, California.)

Check 5044 opposite last page.

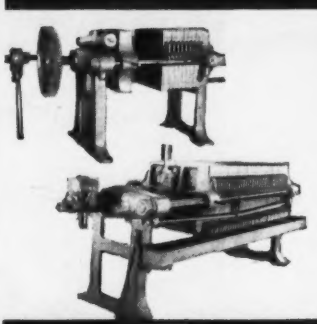
Rocket fuels and resins

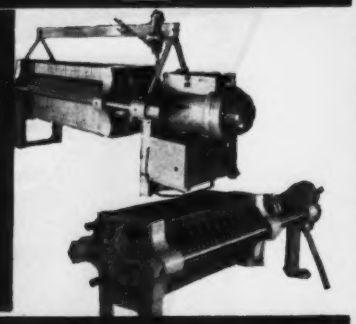
. . . are the main product roles for this 6½′ diam stainless-clad kettle. Now installed at Thiokol Chemical Corp., unit mixes binders for solid rocket fuels and also serves as polyurethane resin reactor. Stainless-clad plates were specified for corrosion resistance and to provide maximum heat transfer from jacket. Vessel is shown ready for shipment.

(Further information about stainless-clad plate may be obtained from Lukens Steel Company, Coatesville, Pa.)

Check 5045 opp. last page.

THIS IS sperry total filtration





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From this firm footing comes the engineering that distinguishes the entire Sperry line. SPERRY FILTER PRESSES: All styles and sizes, with center, side or corner feed; open or closed delivery; simple or thorough washing; high or low temperature controls. SPERRY CLOSING DEVICES: In 8 models including the hand operated HANDRAULIC and popular EHC-L Electric models. SPERRY FILTER MEDIA: All types, all sizes, all material. Plain or punched to your specifications.

This is Sperry Total Filtration. Broad in scope, specific in application. Put it to work on the solution of your particular filtration problem. Write today. Or mail coupon for your free Sperry catalog.

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Check 5046 opposite last page.

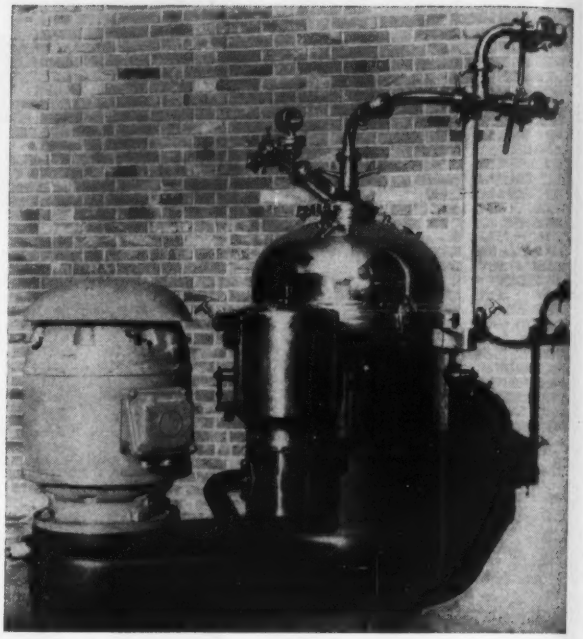
Skilled Hands Know the Difference...

Genuine RIDGID

At Your Supply House!

The Ridge Tool Company, Elyria, Ohio, U. S. A.

Check 5047 opposite last page.

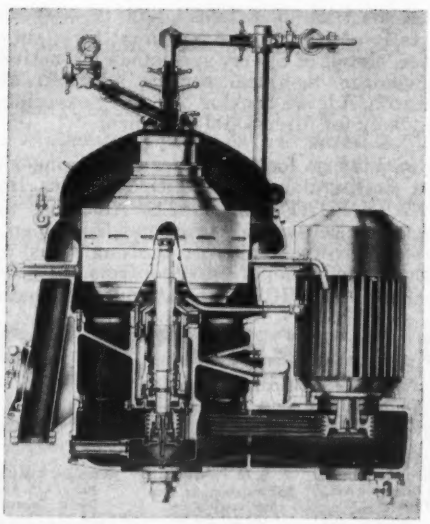


Centrifuge can process up to 8000 gph, desludges every 45 seconds if necessary

No need for downtime . . .

Centrifuge cleans itself

. . . automatically ejects solids at preset time intervals



Heavy-duty, 40-hp vertical motor (right) connected to V-belt drive (bottom) spins centrifuge bowl at speeds up to 5000 rpm

Uses: Clarifying liquids and separating liquid-liquid components or liquid-solid mixtures in chemical, food and allied fields.

Features: Centrifuge can process up to 8000 gph. Design permits continuous operation, by-passing need for manual bowl cleaning. Unit can be set for either complete or partial desludging — to be performed at intervals as often as 45 seconds if desired. Solids are ejected from bowl instantaneously while centrifuge is operating at full speed.

Description: Unit is powered by heavy-duty 40-hp motor with V-belt drive. Bowl speed is up to 5000 rpm. Total bowl volume is 7 gal; sludge holding space 4.2 to 5.5 gal, depending upon size of bowl discs. Machine weighs approximately 4000 lb, occupies 71 x 50 x 55" area.

In operation, liquid to be clarified enters set of discs in bowl, where centrifugal force causes liquid to form fine layers on upper and lower surfaces of discs. Effective clarification is result of carefully

calculated disc angle, which permits solids to slide easily into sludge space of bowl.

At present time intervals, hydraulically-operated "sliding piston" opens bowl ports, allowing solids to be ejected. When solids have been discharged, water shuts off and small amount of water remaining in chamber below piston forces device up, closing bowl.

During partial desludging, only solids are ejected — without dilution of solids or loss of liquid portion. Feed to centrifuge need not be shut off, since bowl is open only long enough for ejection of solids.

The desludging cycle can be controlled either automatically or manually. Length of processing period needed between ejections is determined by amount of solids in feed material.

Various sizes of discs are available, having large or small diameters, with thin or thick spacers. Liquid phase is discharged from unit by built-in pump. Where prevention of contamination is important, centrifuge can be equipped with stainless steel contact parts.

Also available is machine having polished, smooth inner surface, stainless steel, removable hood and an all-316 stainless steel sludge chute.

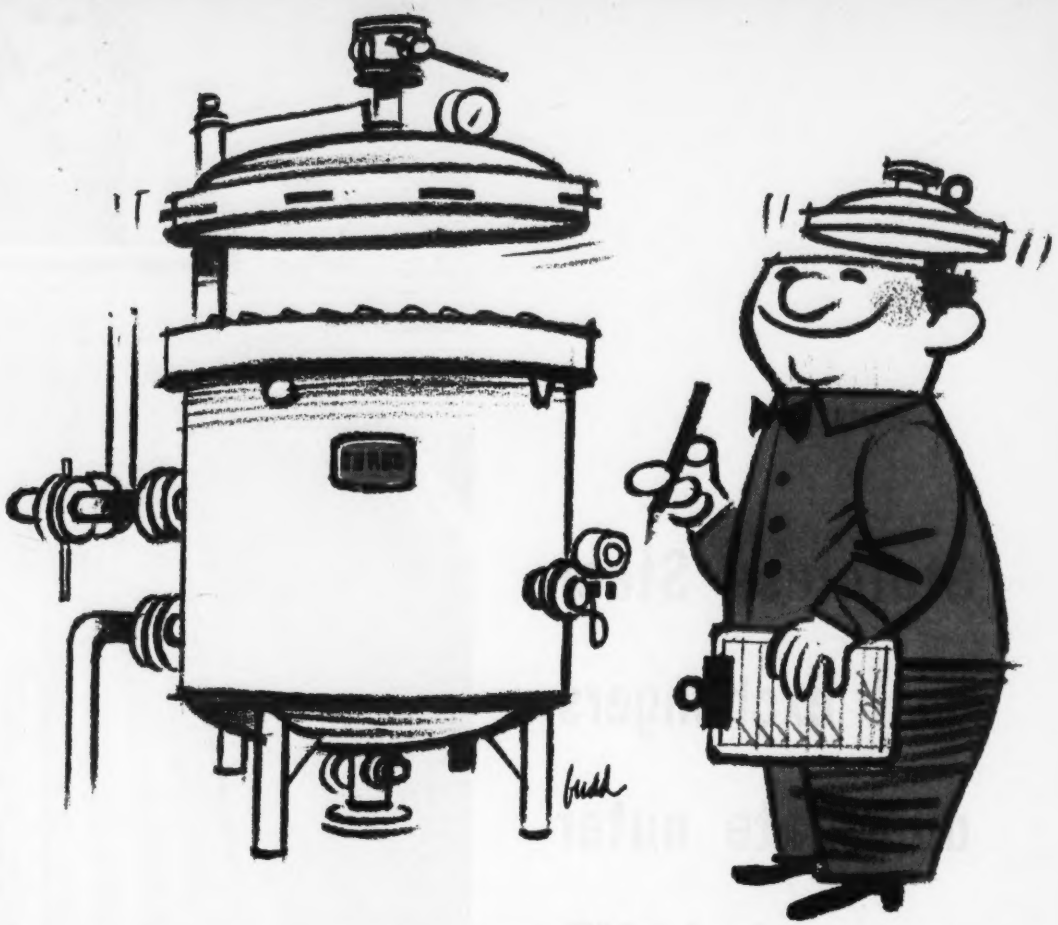
On all models, bowl bottom need not be removed from spindle, if bowl disassembling is necessary. Main seal is easily accessible at top of bowl.

(Further information about Westfalia automatic desludgers, series 15007 and 15037, can be obtained from Centrico, Inc., 75 West Forest Avenue, Englewood, New Jersey.)

Check 5048 opposite last page.

High-shear mixers for fast blending, dispersing and homogenizing use are illustrated in four-page brochure. Described in detail, is mixing head which has dual impellers and stationary stators. Cat "Shear-Flow Industrial Mixers"—Gabb Special Products, Inc.

Check 5049 opposite last page.



YOU'LL FLIP YOUR LID, TOO...

When you check out these features in the **Durco-Enzinger** line of pressure leaf filters:

- Inlet baffling distributes cake evenly over all leaves.
- Patented cake thickness detector.
- Full bottom opening for vertical dry cake discharge.
- Horizontal tank units with retractable leaves.
- Four sluicing options to handle the toughest cakes:
  1. Hydro-Jet Sluice—stationary high pressure sprays
  2. Oscillating Sluice—high impact solid jet moves back & forth across face of leaf.
  3. Traveling Sluice—Moves up & down leaves
  4. Roto-Sluice—for horizontal tank filters—sluice jets rotate through 360°

Couple these features and more with a good basic filter design, ASME Code construction, rugged leaves and real filtration know-how and you have a filter which will handle almost any separation problem.

Write today for Catalog EF/2a.

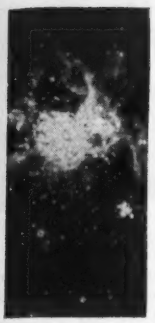
DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

ENZINGER DIVISION

THE DURIRON COMPANY, INC., Dayton, Ohio / Filters • Valves • Pumps • Process Equipment

Check 5050 opposite last page.

Stainless Steel heat exchangers duplicate outer space at -443°F.



Heat transfer units are used to simulate outer space conditions for static missile testing and high velocity gas research. The temperature drops to 443 degrees Fahrenheit below zero and the air pressure to only one-billionth of an atmosphere. Therefore, to obtain good service, *under these extreme conditions of near absolute zero temperature and pressure*, the "PLATECOIL" heat exchangers are made of Stainless Steel.

"PLATECOIL," a new development of Tranter Manufacturing, inc., Lansing, Michigan, was used as the heat transfer unit because it cools 50% faster, requires one-half the space and weighs one-half as much as coiled pipe. The units are made by embossing two sheets of metal with serpentine channels and welding them together to form double-sized channels. "From the first we have used Stainless Steel to make 'PLATECOIL,'" said Mr. C. P. Yoder, Manager of New Products Research and Development. "We made our first installation twelve years ago and the same equipment is still in use today! Our customer specified Stainless Steel to be sure his product would not be contaminated by corrosion.

"'PLATECOIL' is used to jacket the launching tubes on the Polaris submarine. Hot water is circulated through the 'PLATECOILS' to keep the rocket fuel at just the right temperature for quick launching. The units are made of Stainless Steel," reported Mr. Yoder, "to eliminate any possibility of corrosive scaling that might hamper the operation of the missile. No metal can match the strength and corrosion resistance of Stainless Steel. Our customers in the chemical, food processing and petroleum industries have found that Stainless Steel 'PLATECOIL' actually costs less because it lasts so long."

If you have an outer space or down-to-earth corrosion problem, you need the strength and durability of USS Stainless Steel. You can order it through your U. S. Steel representative or local Steel Service Center.

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USS

United States Steel Corporation — Pittsburgh
American Steel & Wire — Cleveland
National Tube — Pittsburgh
Columbia-Geneva Steel — San Francisco
Tennessee Coal & Iron — Fairfield, Alabama
United States Steel Supply — Steel Service Centers
United States Steel Export Company

United States Steel

Stainless Steel

This mark tells you a product is made of modern, dependable Steel

NEW
RADCOR Electric Fluid Heat Transfer Systems . . . go to work fast . . . inexpensively

Radcor puts all the necessary elements of liquid heat transfer into one compact cabinet. Using Chromalox Electric Immersion Heaters, these units contain high-temperature pumps, by-pass relief valve, strainer, expansion tank, temperature controls, contactors and disconnect switches.

This highly efficient unit generates heat right where it's used. None is lost in transfer to your process. Automatic controls generate only as much heat as is required, when required . . . no unnecessarily high pressures.

In addition to various heat transfer oils, other fluids such as Ethylene glycol-water mixtures and water may be used. Temperatures are automatically maintained within 5° of settings.

Ten different models, in two cabinet sizes, range in output from 15,350 to 272,000 Btu's. All electrical equipment is factory prewired, ready for simple hook-up.

Contact us for detailed literature. Or, give us a description of your operation and one of our engineers will gladly give you a specific recommendation. Radcor, Inc., Bradner, Ohio. 91893

Radcor, Inc.
BRADNER, OHIO

A SUBSIDIARY OF EDWIN L. WIEGAND COMPANY

Check 5051 opposite last page.

No reaming, trimming needed with injection blow molder

Uses: Machine is designed to meet requirements of continuous, high speed production of blow-molded products.

Features: Unit is fully automatic. A complete battery of machines can be operated by one man. Separate operator console contains printed circuit board, using plug-in electronic timers and relays as well as plug-in temperature controllers.

Decription: Blow molding machine incorporates a basic hydraulic injection system and uses multiple mold arrangement consisting of two blow mold and blow ejector stations plus one central parison mold station.

Secondary operations such as reaming and trimming are not necessary — products ejected from machine are completely finished.

Parisons are injection molded on a core rod including molding of neck and threaded sections, then shifted into blowing station and blown to final size and shape. Machine is hydraulically and electrically interlocked for mold safety and to insure that product is removed before recycling.

Parison holders can accommodate from one to six spindles, depending upon weight and shape of items to be produced and design of molds. As many as eight to ten can be handled on smaller items.

(Model-1246 Duplimatic blow-molder is product of Moslo Machinery Company, 2443 Prospect Avenue, Cleveland 15, Ohio.)

Check 5052 opposite last page.

Automatic bag shaker available for small dust collectors

Automatic filter bag shaker has been announced for all models of manufacturer's cabinet-type dust collectors. Powered by a separate electric motor mounted on outside of collector, device assures peak

IMPROVED METHODS OF PREPARING TEXTILE PRINTING COLORS

An important technical bulletin has been prepared on this subject, based on actual plant operations developed over a period of many years. It describes basic methods and procedures in detail and shows how significant advantages are now being realized in the preparation of oil-in-water and water-in-oil emulsions through the use of Morehouse Mills and Cowles Dissolvers.

In both types of operations these advantages include—Faster processing of larger batches with thorough distribution of components • Greater volume-per-hour than other equipment • Full control of quality and tints • Important savings in space, operating and maintenance costs • Greater versatility—ability to handle practically any type of material in practically any viscosity range—Dry Pigments, Pulp Colors, Soluble Resins, Dispersable Pastes and Emulsions • Ease of cleaning—rapid change-over without contamination.

Specific advantages in "water-in-oil" method —Rapid grinding of color pigments in resin solutions • Ability to handle all types of such bases • Fast, efficient dispersion of "cut clear" materials • Perfect dispersion in large batches.

Specific advantages in "oil-in-water" method —Complete in-plant preparation of printing color pastes from both dry pigments and color pulps • Perfectly level cuts with thickeners fully dissolved in minimum time • Brighter colors, reproduced to established standards from batch to batch, from month to month.

We are sure this bulletin will be interesting and helpful. Copy will be sent free upon request on your company letterhead for Bulletin 32-1960.

MOREHOUSE MILLS
COWLES DISSOLVERS
610

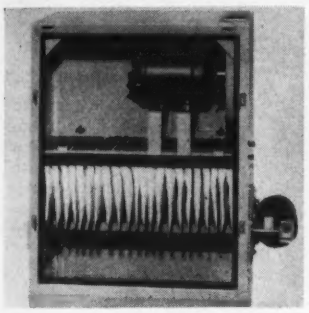
MOREHOUSE-COWLES, INC.
1150 San Fernando Road, Los Angeles 65, California
REPRESENTATIVES IN PRINCIPAL CITIES
CONVENIENT LEASE AND TIME-PAYMENT PLANS

Check 5053 opposite last page.

filtering efficiency by thoroughly shaking the bags whenever dust collector is turned off.

Motor oscillates shaker bar mounted horizontally below bags. Metal fins on bar strike against each filter bag, freeing dust particles and causing them to drop into dust tray.

After two minutes, cleaning mechanism automatically shuts off. It does not start again until collector has gone



Interior of dust collector fitted with automatic bag cleaning device. Outside motor (right) oscillates shaker bar

through another on-and-off cycle. Shakers are available with single-phase, 110 or 220 v, 60 cy motors. Prices range from $180 to $450.

(Further information about automatic bag shaker may be obtained from Torit Manufacturing Co., 1133 Rankin St., St. Paul 16, Minn.)

Check 5054 opposite last page.

Unit can be converted into three kinds of mill

Designed to permit use of different heads

Uses: Grinding various products in chemical and allied industries.

Features: Utilizing a common component in conjunction with three different heads, mill can be operated as an overflow (rod or ball), a peripheral discharge or a diaphragm mill.

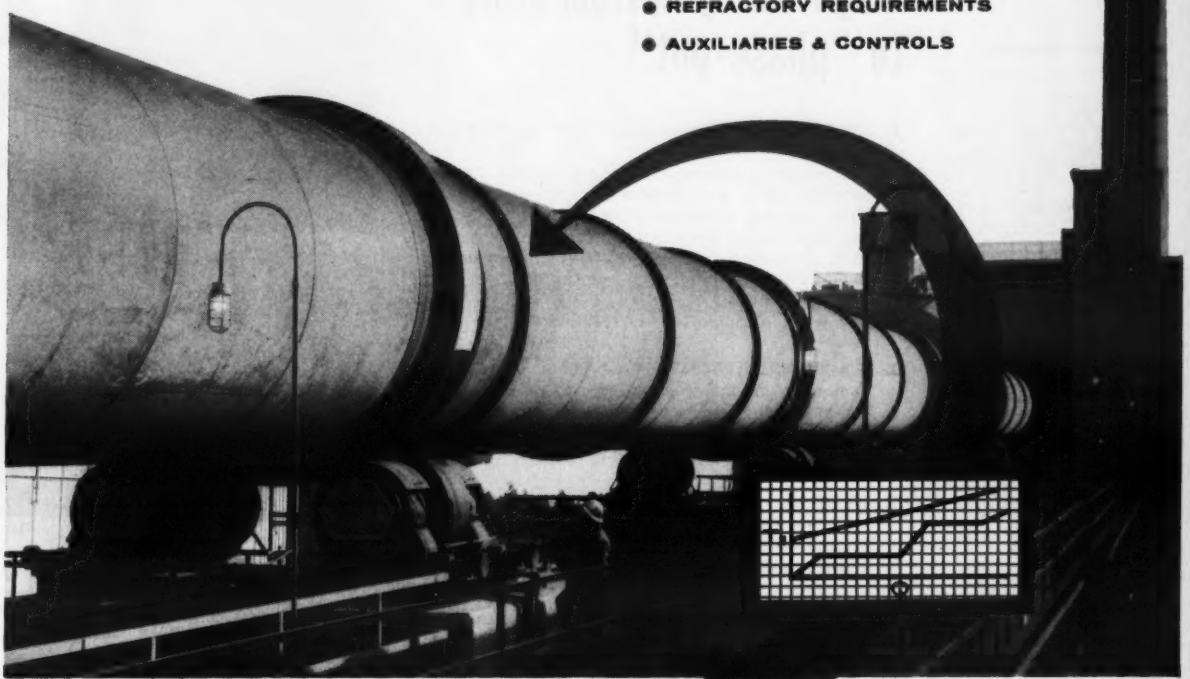
Description: Grinding mill, although a single unit, has three basic designs incorporated into it. When used as overflow mill, head is of flush

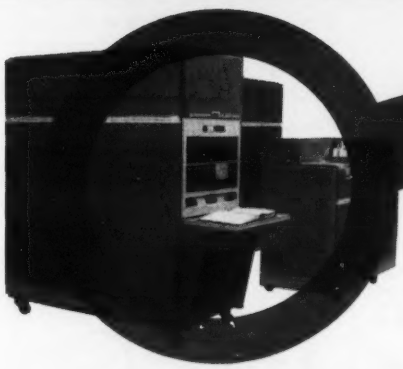
Another reason for the superiority of

KENNEDY ROTARY KILNS

KENNEDY has taken the *GUESSWORK* out of Rotary Kiln design by use of a modern digital computer to determine . . .

- HEAT TRANSFER
- FIRING EFFICIENCY
- OPTIMUM DIMENSIONS
- REFRACTORY REQUIREMENTS
- AUXILIARIES & CONTROLS





IBM 650 Data Processing System used by KENNEDY Engineers for Rotary Kiln Calculations.

. . . es the *more than 100 variables* in a kiln oper- . . . in less than an hour solves the basic equations . . . essary to determine optimum design.

KENNEDY's already established reputation in kilns for . . .

- Lime, dolomite & magnesite burning
- Cement, wet or dry process
- Ore nodulizing
- Coke calcining

. . . is further enhanced by this new, more scientific approach.

KVS

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MANUFACTURING & ENGINEERING CORPORATION

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Primary & Secondary Gyratory Crushers • Jaw Crushers • Roll Crushers • Impact Breakers • Hammer Mills • Rod & Ball Mills • Kilns & Kilns Accessories • Dryers • Scrubbers • Screens • Pneumatic & Mechanical Conveyors • Complete Crushing, Lime, Cement & Carbon Paste Plants. Research & Testing Service.

Check 5055 opposite last page.

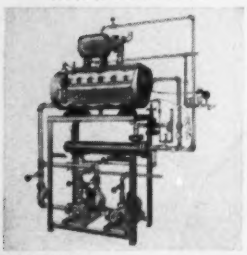
specialists

in complete condensate handling and boiler feeding systems

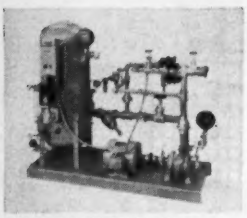
SCHAUB

stays with you from start to "phase-out"

TYPICAL COMPONENTS



ZERO-OXYGEN DEAERATING SYSTEMS
Guaranteed oxygen removal to .005/cc liter under 10-to-1 load swings, up to 250,000 lbs./hr. Other deaerators for smaller needs.



QUIK-TEMP HEATING AND DRAINAGE SYSTEMS
Continuous steam and air removal eliminates steam traps and drainage device maintenance.

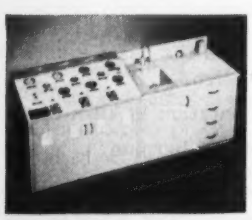
1. **YOU STATE YOUR NEED**—with no "ifs" or "buts".

   For instance, you may need a complete condensate handling and deaerating system, starting with outlying condensate return units discharging to a central surge tank. *Plus* transfer pumps with sequence controls to feed the deaerator itself. Finally boiler feed pumps and the controls to make the whole system work — with any degree of automation you require.

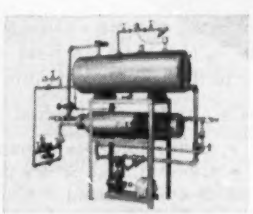
2. **SCHAUB WILL ENGINEER AND DELIVER** you such a system — or any part of it — and underwrite its continuous performance. All components are "phased-out" to work together as an integrated and balanced whole.

3. **OR WE WILL SUPPLY** you with individual packaged units — from pumps to console blowdown systems — to expand, augment or improve an existing system.

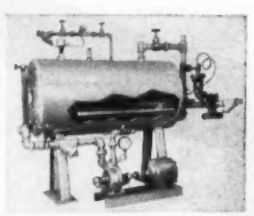
This is what we mean by Schaub "one-source" responsibility. From concept, through design to installation and service, you go best when you go Schaub — *all the way.* Hundreds of Schaub owners and engineers agree!



PACKAGED CONTINUOUS BLOWDOWN SYSTEMS
Automatic flash heat recovery, timer flush, sample cooling, drain after-cooling, high level shutdown, for any number of boilers.



HEAT RECLAIM SYSTEMS
Save about 10% on fuel with large percentage high pressure return systems.



PREE-HEET SYSTEMS
Stretch boiler capacities during peak loads while maintaining optimum pressures. Prolong life of boilers and return lines.

FACTORY-TRAINED REPRESENTATIVES COAST-TO-COAST. SPECIALIST ENGINEERS TO ADVISE, SUPERVISE INSTALLATION AND INSTRUCT IN MOST EFFICIENT OPERATION.

FRED H. SCHAUB ENGINEERING CO.
2112 S. Marshall Blvd., Chicago 23, Illinois

Please send my copy of technical data and Catalog No. 55-D.

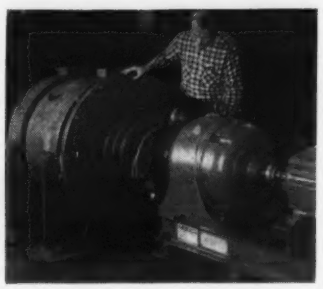
NAME _____

CLIP AND ATTACH TO YOUR LETTERHEAD

Check 5056 opposite last page.

covering surface construction with four discharge holes in a protruding discharge chamber.

Spacers added to shell's discharge end and an attached flat head with a stub shaft connected to cable coupling, converts unit to an end-peripheral discharge mill with



Mill can be converted to operate as an overflow, peripheral discharge or diaphragm unit

discharge between the spacers. A perforated plate added between spacers and shell transforms machine to diaphragm ball mill.

Mill is connected to a triple-reduction reducer through cable coupling which transmits torque from reducer. This also takes care of any misalignment resulting from bearing wear. Ends of mill are free for easy head change. Mills have 3′ diam and are available in 3, 4, 5, 6 and 8′ lengths.

(Trunducer grinding mill is product of Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin.)

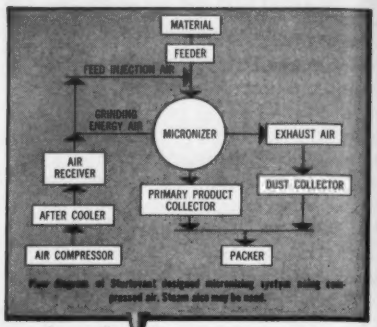
Check 5057 opposite last page.

"When did you come to the conclusion that this pipe should be insulated?"

Idea by S. L. Alessandroni, Badger Mfg. Co.

Need ½ to 44 Microns?

Sturtevant Micronizers* Make 325 Mesh Obsolete



Flow diagram of Sturtevant designed micronizing system using compressed air. Steam also may be used.

One Operation Reduces, Classifies

Sturtevant Micronizers grind and classify in one operation in a single chamber—provide fines in range from ½ to 44 microns to meet today's increased product fineness needs. Can handle heat-sensitive materials.

Production Model (15 in. chamber)

No Attritional Heat

Particles in high speed rotation, propelled by compressed air entering shallow chamber at angles to periphery, grind each other by violent impact. Design gives instant accessibility, easy cleaning. No moving parts.

Classifying is Simultaneous

Centrifugal force keeps oversize material in grinding zone, cyclone action in central section of chamber classifies and collects fines for bagging. Rate of feed and pressure control particle size.

Eight Models Available

Grinding chambers range from 2 in. diameter laboratory size (½ to 1 lb. per hr. capacity) to large 36 in. diameter production size (500 to 4000 lbs. per hr. capacity). For full description, request Bulletin No. 091.

Engineered for Special Needs

A 30 in. Sturtevant Micronizer is reducing titanium dioxide to under 1 micron at feed rate of 2250 lbs. per hr. For another firm, a 24 in. model grinds 50% DDT to 3.5 average microns at a solid feed rate of 1200-1400 lbs. per hr. A pharmaceutical house uses an 8 in. model to produce procaine-penicillin fines in the 5 to 20 micron range. Iron oxide pigment is being reduced by a 30 in. Micronizer to 2 to 3 average microns.

Sturtevant will help you plan a Fluid-Jet system for your ultra-fine grinding and classifying requirements. Write today.

Can Test or Contract Micronizing Help You?

Test micronizing of your own material, or production micronizing on contract basis, are part of Sturtevant service. See for yourself the improvement ultra-fine grinding can contribute to your product. Write for full details. STURTEVANT MILL CO., 119 Clayton St., Boston, Mass.

*REGISTERED TRADEMARK OF STURTEVANT MILL CO.

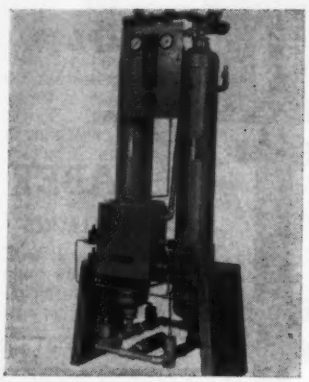
Check 5058 opposite last page.

Air dryer protected against power failures by safety device

Assures continuing flow of dry air for several hours

Safety device for protecting air systems in case of electric power failure has been added to manufacturer's air dryers. Feature provides continuing flow of dry air for several hours after power has failed, and usually as long as compressed air is available at inlet connection of dryer.

If power failure occurs, both chamber inlet valves of



Air dryer is equipped with "fail-safe" device that protects air system in case of power failure

device open, while purge valves simultaneously close. Air stream is fed through the two chambers and out through effluent connection.

Inherent state of desiccant in dryer is one of extreme dryness, providing reserve of drying ability in each desiccant bed — usually in order of 75 to 80%. If power fails, dryer becomes in effect, a static desiccant-type unit.

Time period of "fail-safe" operation is significantly longer than is possible with comparable size dryer using heat reactivation principle. Immediately after power is restored, dryer reverts to normal operation.

(Further information about Heat-Les dryers may be obtained from Trinity Equipment Corporation, Cortland, New York.)

Check 5059 opposite last page.

***HIGHER** Thermal Efficiencies . . . . . **GREATER** Savings*
In Industrial Process Heating!

THE HI-TURBIANT HEATER

If you have any process operations — large or small — where process fluids are heated, directly or indirectly, investigate now the substantially greater thermal efficiencies and lower operating costs the Hi-Turbiant Heater is bringing to other processing applications similar to yours.

As shown in the cutaway view, the Hi-Turbiant has both radiant and re-radiant heating zones — a unique advancement that insures more uniform heat absorption throughout the entire tubular network!

High fluid turbulence, maintained by high-temperature pumps, reduces boundary-layer vaporization and assures substantially greater heat efficiencies without vaporization problems!

More uniform heating permits greater height-to-diameter ratio — therefore fewer "hairpins" in the tube system for more efficient fluid flow, lower pumping costs, greater operating economies!

Because of these and other unique Hi-Turbiant advancements, you make multiple savings in process heating applications — savings in size of unit required, savings in fuel costs, savings in pumping costs, savings in plant space. Send for illustrated bulletin that gives detailed data and shows typical systems. *Ask for Bulletin #HT-100!*

TWO BROAD FIELDS OF APPLICATION!

1. Heating Transfer Fluids (Dowtherm, Aroclor, Hydrocarbon oils, etc.) used in heat processing.
2. Direct Firing of process streams (Rich-Oil denuding, asphalt heating, etc.) where fluids must be heated under close thermal control.

In both types of application, the Hi-Turbiant Heater brings new standards of efficiency, new savings in processing costs!

COMPLETE RANGE OF SIZES — ½ TO 40 MILLION BTU/Hr.

Also, single user "package" units 200,000 to 1,500,000 BTU/Hr.

There's a Hi-Turbiant Heater to fit your requirements!

Z-122

WESTERN PRECIPITATION
DIVISION OF JOY MANUFACTURING COMPANY
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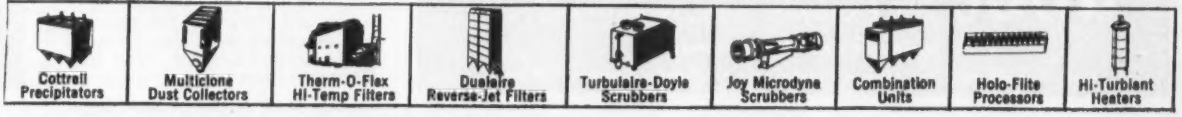

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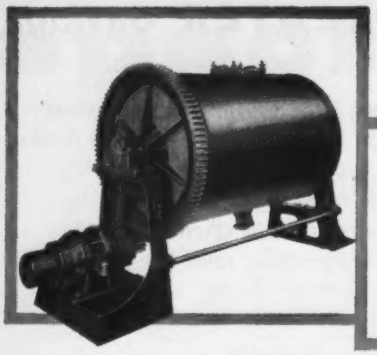
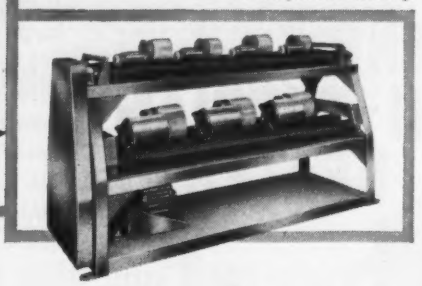


Style GPH Pebble Mill for Large Pulverizing and Grinding Operations.



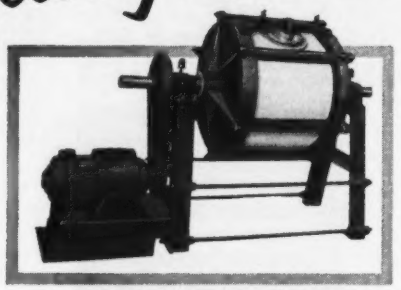
Style P, Two-Tier Jar Rolling Machine for Multiple Batch Processing.

modern equipment for

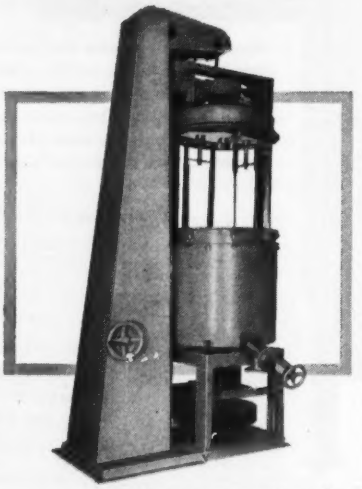
Profitable Chemical Processing... by abbé

Profitable processing of your materials requires modern, precision-built equipment able to maintain uniform quality standards at high production rates. Abbé Engineering offers a complete line of mixing, blending, crushing, grinding, cutting and sifting equipment designed to give top quality production at low operating costs. Abbé Engineering equipment offers you many labor- and time-saving features to simplify your production operations.

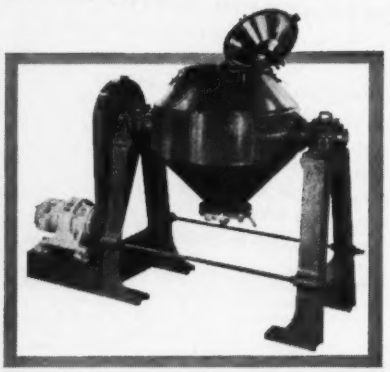
Our engineers will be glad to assist you in solving any problem you may have involving mixing, blending, crushing, grinding, dispersing, cutting or sifting of your materials.



Eureka Style Porcelain Jar Mill for Small Batch.



Jacketed Vacuum Dispersall Paste Mixer for Homogenizing Pastes.



Style BS Double Conical Blender for Rapid, Uniform Dry Blending.

Send for our General Catalog No. 80

abbe' ENGINEERING COMPANY
620 E Graybar Bldg., New York 17, N. Y.
Designers and Manufacturers of
Ball, Pebble and Jar Mills • Pulverizers • Sifters • Cutters • Mixers

Check 5061 opposite last page.

NEW LITERATURE
Processing Equipment

Advantages of redesigned stainless-steel gyratory screen are told in six-page bulletin. Features make unit easier to install, dismantle and clean. Tables of dimensions and comparative openings of screen cloth are listed. Bul 06B8446A — Allis-Chalmers Manufacturing Company.

Check 5062 opposite last page.

Uses of diatomite in paper and pulp mills are discussed in 10-page technical bulletin. First section is devoted to the addition of the material to the furnish as means of improving operation and product quality. Second section deals with use in filtration of paper mill waters for reclamation, recirculation and prevention of stream pollution. Bul F53 — Dicalite Department of Great Lakes Carbon Corporation.

Check 5063 opposite last page.

Dust separation by cyclonic action is discussed in eight-page bulletin. Performance data, installation photos, selection and dimension charts for manufacturer's dust collectors are included. Units have no moving parts and handle from 250 to 23,750 cfm. Bul D-20 — The Day Company.

Check 5064 opposite last page.

Chlorinators capable of handling three to 2000 lb per day of chlorine gas are pictured and described in eight-page catalog. Both manual and automatic models are considered. Emphasis is placed on safety stack regulator, the control element of the chlorinator. Bul "Controlomatic Chlorinator" — Fischer & Porter Company.

Check 5065 opposite last page.

Gyratory sifters are topic of four-page bulletin. Specifications are tabulated. Drawings describe operation of different models. Bul G-260 — Robinson Division, The Young Machinery Co., Inc.

Check 5066 opposite last page.

Size reduction, classification and pelleting machines and pulp and paper mill equipment are featured in eight-page, illustrated bulletin. Bul 200-B—Sprout, Waldron & Company, Inc.

Check 5067 opposite last page.

Dimensions and capacities of 11 sizes of single-roll crushers are tabulated in eight-page bulletin. Operation and design of machine are also described. Bul 2020—Pennsylvania Crusher Division, Bath Iron Works Corporation.

Check 5068 opposite last page.

PUMP PROBLEMS
write
TABER

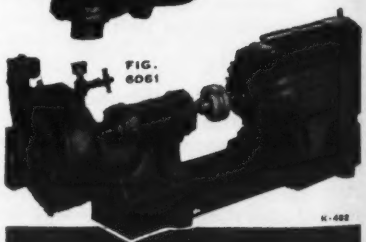
BEFORE DECIDING ON TYPE OF PUMPS . . .

SEE TABER BULLETINS

May avoid costly pump misapplication.

Vertical pump illustrated, for handling chemicals, please request Bulletin V-837. Horizontal Pump, Bulletin C-355.

TABER PUMP CO.
Est. 1859
291 ELM ST.
BUFFALO 3, N. Y.



TABER

Check 5069 opposite last page.

"The Story of Alkyd Resins", a 50-page brochure, tells how to make alkyd-type synthetic resins. Materials, formulas and processing steps are covered in detail — including operating conditions. Origin and classification of resins are also discussed. Photographs, drawings, tables and charts depict equipment used and various processing aspects. "The Story of Alkyd Resins" — Brighton Corp.

Check 5070 opposite last page.

Micro-processing equipment for removing solid, liquid or vapor contaminants — in micron size and small quantities — from fluid systems, is subject of four-page bulletin. Cutaways and brief descriptions are included. Bul MP-1 —Selas Corporation of America.

Check 5071 opposite last page.

Liquid-liquid extractors, entrainment separators and other chemical processing equipment are discussed in four-page bulletin. Photographs and drawings picture construction and operation of wire-mesh devices. Bul 27—Otto H. York Co., Inc.

Check 5072 opposite last page.

How to select proper sized dryer for providing dry air or gas with dewpoints down to −100°F, is told in four-page booklet. Operational and mechanical specifications are included. Bul A-309 —Trinity Equipment Corp.

Check 5073 opposite last page.

Heat exchangers — 3" diam, low-pressure, double-pipe units — are described in eight-page brochure. Cutaways of shell-to-tube closure and tube side joint and return bend housing are shown. Bul 110 —Brown Fintube Company.

Check 5074 opposite last page.

Operation and maintenance of rotary lime sludge kilns is topic of discussion in 16-page, two color booklet, Bul TKB-1—Traylor Engineering and Manufacturing Div., of Fuller Company.

Check 5075 opposite last page.

Ribbon blenders are subject of technical brochure. Capacities and dimensions are listed. Four types of agitators are shown. Ribbon Blender Brochure—Tower Iron Works.

Check 5076 opposite last page.

New concept in rotary kiln design is reviewed in 10-page brochure. Drawings and photos illustrate patented features. Full technical data is included. Rotary Kiln Brochure—Vulcan Iron Works Inc.

Check 5077 opposite last page.

ANACONDA CONDENSER AND HEAT EXCHANGER CLINIC

"Cupralum," lead-surfaced Anaconda copper tube, offers practical answers to some tough corrosion problems

If you'd be interested in more compact, more economical heat transfer units for handling corrosive liquors — sulfuric, chromic, phosphoric acids, sulfites, sulfates, alum, and the like — you should know about Cupralum*. Cupralum, a product of Knapp Mills, Inc., is Anaconda copper or copper-alloy tube to which a uniform, dense-structured, extruded chemical lead surfacing has been metallurgically bonded.

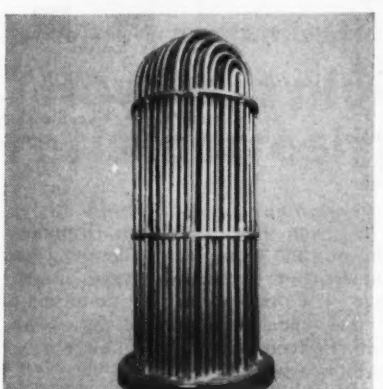
Alfred P. Knapp, chairman, Knapp Mills, Inc., explains to visitors how his company's patented drawing process metallurgically bonds lead surfacing to copper tube.

THE OUTSIDE lead surface, which may be from ⅛" to ½" thick, resists concentrations of acids—of sulfuric acid, for example, up to about 85% and up to 428 F. Being bonded to the copper, it expands and contracts with the copper during temperature cycling. Without the metallurgical bond, the lead would creep and eventually fail—an inherent weakness of all-lead tubing.

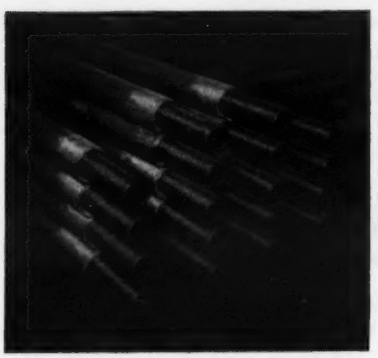
THE COPPER or copper-alloy tube inside provides strength to make Cupralum self-supporting — and to stand steam pressures up to 150 psi in standard wall thicknesses offered. It also provides its high corrosion resistance internally to cooling waters, steam, and refrigerants.

Most important, copper offers its high heat transfer rate. Because of the metallurgical bond with the lead, the over-all heat transfer rate of Cupralum is high—higher than all-lead tube and higher than that of iron and steel.

THE NET RESULT is that a given heat transfer job can be done with fewer square feet of surface — for a more compact unit. Or it is possible to get increased capacity in present existing space.



Two U-bend Cupralum tube bundles like this are used in a Ferrolum (lead-surfaced steel) separator tower to boil off ammonia from a urea carbonate ammonia solution—in the production of urea fertilizer. Anaconda copper tube core 1" O.D., 12 gauge, handles 150-lb. steam. Lead surface is 3/16 inch thick. Separator tower operates at 145 C (293 F) and 240 psi.

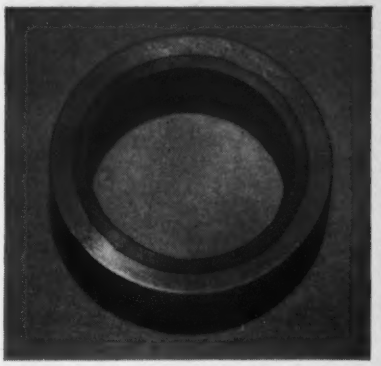


Lead surfacing removed from ends of Cupralum tubes preparatory to insertion in lead-clad steel tube sheet. Tube ends are usually rolled, but for severe thermal cycling service, may be brazed to outer steel face of tube sheet.

In many cases, the first cost of the coil is lower. Usually this is true where higher steam pressures than those previously used are available—or where expensive, hard-to-fabricate alloys have been used. Improvement of the heating or cooling cycle is another source of savings. Under any circumstances, a long operating life and easy maintenance provide over-all economy.

NUCLEONIC APPLICATIONS. Cupralum with a thicker surfacing of lead is being used increasingly in the nuclear industry. For gamma shields that must be cooled, Cupralum coils are built in to provide efficient heat transfer from the shield to the cooling medium.

Where radioactive liquors and spent resin discharge from demineralizers must be conveyed through process piping into process vessels for concentrating the radioactive solution, Cupralum piping prevents the escape of gamma radiation. In nuclear applications, the lead surfacing may be 1" to 8" thick.



Cutaway section of Cupralum tube. It is produced in 20′ lengths or in long continuous coils —from 40′ to 100′ depending on diameter. It is easy to bend and fabricate. Reliable jointing techniques have been developed.

Lead surfaces of Cupralum tubes and of tube sheet are fused by lead-to-lead welding. Then an extra thickness of lead is applied at the joint for extra protection.

FOR MORE INFORMATION. For detailed data on Cupralum, write Knapp Mills, Inc., Wilmington, Del. Or see your Anaconda representative, who can also provide data on the full line of Anaconda copper and copper-alloy tubes—arrange for technical assistance in meeting special corrosion and heat transfer problems. Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6071L

*Registered trademark of Knapp Mills, Inc.

ANACONDA

TUBES AND PLATES FOR CONDENSERS AND HEAT EXCHANGERS

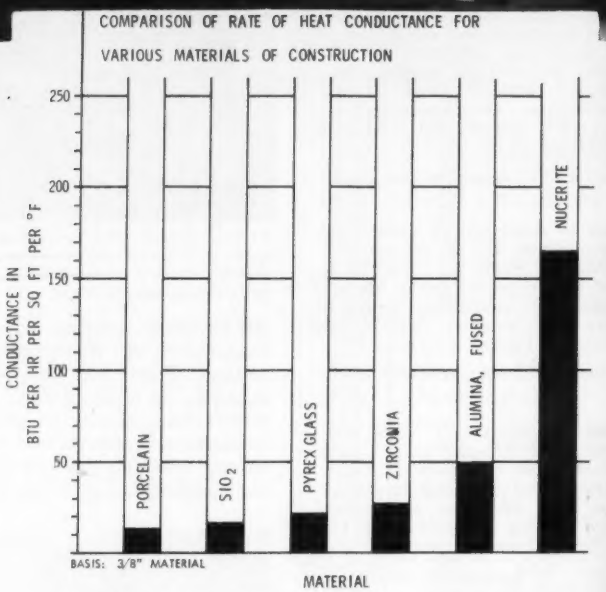
Anaconda American Brass Company

Check 5078 opposite last page.

In the thermal shock test a coating of 0.020" on a ½" mild steel base was fired at 1250°F for 15 min. After removal from the furnace, ice water was poured on the surface with no visible damage to Nucerite — an approximate temperature difference of 1200°F

Corrosive Vapors at 1300°F No Problem For Nucerite

Nucleated crystalline glass coated metals extend scope of application where high temperature and pressure — erosion — abrasion — vapor corrosion problems are encountered



Comparison of rate of heat transfer for various materials of construction. Nucerite shown is in the form of a 25-mil-thick coating on ⅜" Inconel

A new form of crystalline glass, with unusual resistance to hot corrosive environments, is expected to find interesting applications in the chemical processing field.

High-temperature, vapor-corrosion applications have been a bugaboo in the chemical industry for a long time. Now, with the announcement of Pfaudler Nucerite, it appears that the problem of withstanding temperatures up to 1300°F where erosion, abrasion and high pressures are encountered has been solved. (This temperature may be exceeded by several hundred degrees, depending on type of service.)

In aqueous environments the material's resistance to corrosion is superior to most metals.

It has long been the desire of Pfaudler to develop a harder glass than that now known, and this new material is the culmination of more than five years of research and development work. It is expected that the new material will expand the scope of applications, rather than replace the company's current corrosion-resistant materials.

What Is Nucerite?

Nucerite is a family of ceramic-metal composites. Its unique characteristics are a result of closely controlled nucleation and crystallization within certain ceramic formulations. Agents are used which act as centers of nucleation during a heat-treating cycle which follows application of the ceramic components to the base metal. Carefully controlled nucleation and crystallization result in a ceramic structure characterized by a large number of very small crystals. It is this structure that imparts these unusual physical and chemical properties to the material.

Will Open New Fields of Application

The development indicates interesting new uses in the process industries. Expansion of these industries, broadening areas of application, and new technology have created a demand for new materials of construction that have not been heretofore suitable or available.

It is expected that Nucerite will be of value in increasing the rate of chemical reactions which may now be held back for lack of a material that will withstand corrosive attack at high temperatures.

A number of formulations have been devised, and several nucleating agents employed, which are available now for various base metals. Later a standard line will be made available after complete field data are secured.

Factory Application

Nucerite coatings are applied by a multiple coat system. A ground coat is used to provide a basic adhesive coat to the base metal. Ground coat and metal are exposed to a high temperature firing at which time the oxides, formed by the steel at 1800-2000°F,

are absorbed by the glass fissures to form a physical and chemical bond.

Later successive coats of the final material are applied and fused to the basic ground coat. The coats are usually

In a 9' drop test of a 2", round, 1.2-lb ball, a ⅜" safety glass plate was shattered. Although the illustration discloses no damage to the Nucerite, a slight crushing did occur after a similar test

applied in separate ten-mil increments up to a maximum thickness of 40 mils. Coating applications and firing procedures are similar to current method used in conventional glass corrosion-resistant materials.

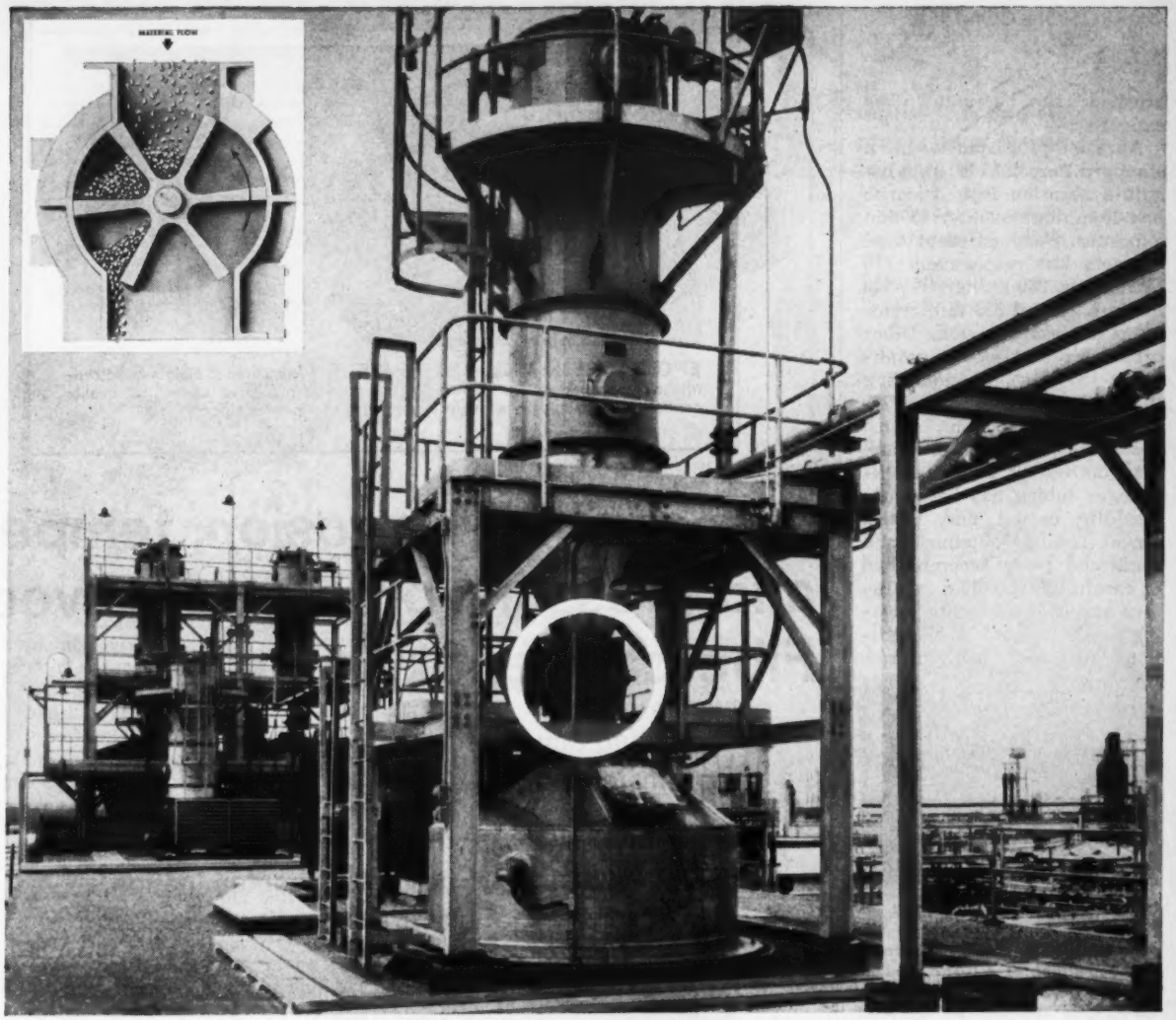
Lab Tests Point Up Unusual Properties

Hardness—Nucerite has a Rockwell hardness of C-23 to C-50; carbon steel, C-30.

Tensile Strength — Three ⅛" round rods supported on parallel knife edges were subjected to a suspended load. A soda-lime glass rod broke at 25,000 psi. A mild-steel rod was permanently deformed at 85,000 psi. The ceramic portion of Nucerite in rod form withstood the 85,000 psi with no failure or permanent deformation. While a ⅛" bend occurred in the test, the Nucerite rod returned to normal after release of the load.

Rifle Impact — A .22-caliber rifle bullet fired at a 1-⅛" pine board, with a window glass behind, shattered the window glass at a 25' distance.

When the bullet was fired direct at a 0.020"-thick Nucerite coating on ⅜" Inconel, the coating surface was slightly



THIS RECEIVER on the roof of a processing building feeds polyethylene into storage bin through rotary lock (circle). Rotor and body (inset) are made of corrosion-resistant, non-contaminating CF-20* alloy, a nickel-containing alloy many producers rate on top for handling highly-sensitive chemical products.

Solving a contamination problem...

How cast nickel stainless steel rotary locks resist corrosive attack...protect product purity

In the pneumatic conveying unit shown above, cast nickel stainless steel rotary locks regulate the flow of polyethylene to processing equipment.

Nickel stainless steel, with its hard, smooth surfaces, does not chip or erode, thereby protecting the polyethylene from metallic contamination as it passes through the six-compartmented locks. What's more, the alloy's smoothness prevents the product from hanging up on inside surfaces, prevents clogging. That means no costly losses through downtime and maintenance.

This is a typical example of how the corrosion resistance and strength of nickel stainless steel solves many problems in the chemical processing industries. Especially in the large-volume manufacture of products highly sensitive to contamination.

If corrosion, scaling or chipping threatens to contaminate your product, it will pay you to look into a new, 64-page booklet we've just issued. Titled "Heat Resistant Castings, Corrosion Resistant Castings...Their Engineering Properties and Applications," it contains a wealth of usable up-to-date information on the selection of proper alloys to solve your contamination problem. Write for a copy today. Just ask for booklet A-266.

*ACI designation

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N. Y.

INCO NICKEL
NICKEL MAKES ALLOYS PERFORM BETTER LONGER

Check 5079 opposite last page.

crushed. No bar-metal was exposed.

Abrasion Resistance—In a standard Porcelain Enamel Institute abrasion test, Nucerite lost 40 milligrams after 45-min exposure. Four different type enamels lost respectively 110 milligrams, 260 milligrams, 320 milligrams, and 625 milligrams after the same period. Other properties are shown graphically in the accompanying illustrations.

During development such process equipment as small reaction vessels and heat exchanger tubing has been successfully coated and tested. Since results obtained and confirmed were accomplished in carefully controlled laboratory and field tests, more testing under actual use-conditions will still be required.

High-temperature bonding test. A ½-lb stainless steel dumbbell was placed on a 30° inclined Nucerite plate consisting of a 0.020" ceramic coating on ¼" Inconel (right). The other ½-lb stainless-steel dumbbell was placed on a 30° inclined ¼" Inconel plate with a 0.020" soda lime glass thermally fused coating

Both plates were fired at 1700°F. After 15-min exposure, dumbbell on the glass surface removed a major portion of the glass from the metal. Nucerite coating showed no softening, bond entirely maintained, no movement of dumbbell, and surface integrity maintained

Other suggested applications include its use on valves, pipe, fittings, bearings, and seals.

Currently, an extended evaluation program of selected field testing is planned.

Technical groups interested in learning more about Nucerite may inquire about the availability of a color sound film covering the product's properties.

(Nucerite is a product of The Pfaudler Co., a division of Pfaudler Permutit Inc., Rochester 3, New York.)

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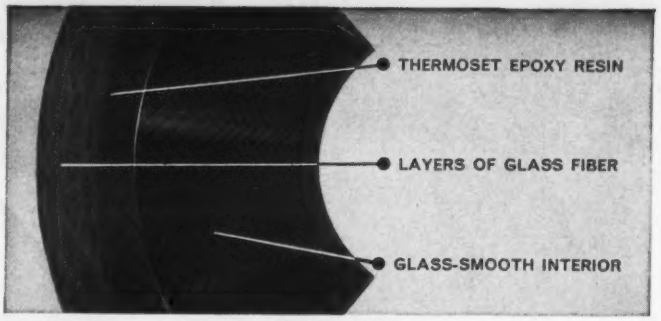
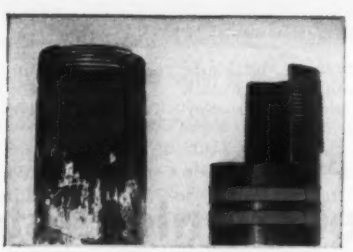


EPOXY RESIN AND GLASS FIBERS combined in a high-speed centrifugal casting operation. High quality components processed under rigid quality controls bring to industry a unique and efficient non-metallic pipe.

"Impossible" corrosion, temperature and pressure problems solved by Fibercast® epoxy pipe

- Operating temperature range wider than any non-metallic pipe (–65° to 300° F.)
- Operating pressure range extends to 1000 psi.
- Effectively combats corrosion, contamination, abrasion, scaling, electrolytic action.



Fibercast Tubing (right) used to suspend a 1,200 lb. pump for 3 years in a salt water supply well. *There was no loss in strength.* The damaged plastic-coated steel nipple (left) was used in the same installation, failed after 3 months' service.

WHAT is Fibercast?

It is a centrifugally cast, thermoset, epoxy resin reinforced pipe that handles temperature and pressure problems where no other non-metallic pipe will do.

Its body of woven glass fibers provides resistance to high tension forces. These fibers, combined by adhesion, are imbedded and bonded by heat in epoxy resin. The result is a strong, long-lasting pipe with remarkable ability to withstand high pressure and temperature in corrosive environments.

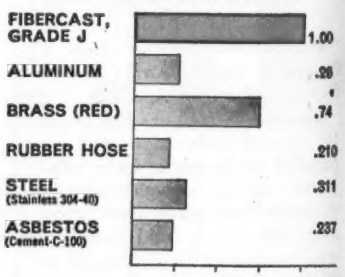
WHY use Fibercast?

For a multitude of reasons. Because its advantages range from superior resistance to heat, pressure and corrosion, to its ease of handling, light weight, dielectric properties and structural stability. Because Fibercast's long service life alone would justify choosing it over other materials. Because even more expensive metal pipe or pipe with thermo-plastic interior coatings cannot match Fibercast's proven durability. Case histories and accurate testing have proved over and over that Fibercast performs better, lasts longer, costs less. Out of 338 common corrosive solutions, Fibercast competently handles 320. And naturally, Fibercast's unique and lasting qualities under such conditions mean that it drastically reduces maintenance and replacement costs, too.

Although Fibercast's light weight makes it correspondingly easy to work with (it is less than 25% the weight of steel), it has the same basic linear coefficient of expansion as steel (7.06 x 10^{-6} to 8.25 x 10^{-6} in./in./°F.). Fibercast's strength permits installation on pipe racks with span lengths generally used for metal pipe.

The pipe has a smooth interior, with a Hazen-Williams C Flow Factor of 147. This cuts friction losses, aids flow and tends to resist build-up. It is a non-conductor (accepted by the electrical industry as a superior insulator), and is not subject to cold flow. A low coefficient of heat transfer (3.0 x 10-3 Cal/CM²/sec/CM°C.),

COMPARATIVE LIFE DATA*



*Basing Fibercast as unit life of 1 and others as comparative percentages thereof.

minimizes heat loss and may even eliminate heat tracing.

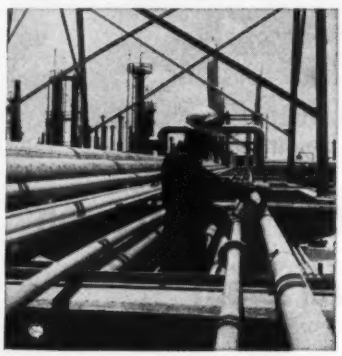
All three major systems of joining all pipe are used with equal success on Fibercast. They are: standard flanged, cemented, and threaded and coupled with a complete selection of Fibercast fittings (the world's largest line of corrosion-resistant epoxy pipe fittings).

Safety, too, is an important reason for using Fibercast Pipe in transporting dangerous chemicals, particularly in areas where the pipe is adjacent to personnel. Most piping materials corrode undetectably from inside-to-out and can suddenly burst without warning, inflicting injury to personnel. Because of Fibercast's woven glass fiber construction, such occurrences, if they ever occur, *are* detectable in minute, repairable leaks.

WHO uses Fibercast?

The petroleum industry . . . chemical . . . petro-chemical . . . nuclear energy . . . textile . . . paper . . . and food-processing industries . . . countless operations handling acids, alkalies, salt water and other corrosive liquids under pressure can all use Fibercast profitably.

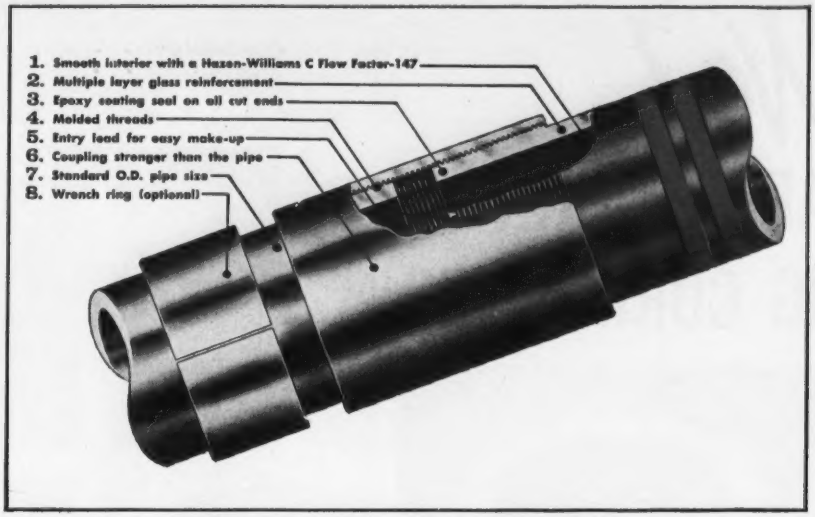
In oil country, Fibercast is already



Workman is painting a section of Fibercast Pipe bearing 32% HCl at Shell's Texas Chemical plant. Note that Fibercast has sufficient strength for installation on span racks with the spacing normally used for metal pipes.

widely acclaimed for superior performance in rugged, abusive and even high pressure installations like salt water disposal wells and horizontal lines. In cases where other pipe and tubing required replacement after just a few weeks of service, Fibercast is still performing efficiently after many years.

In petro-chemical and chemical-processing plants, Fibercast is valued


1. Smooth interior with a Hazen-Williams C Flow Factor-147
2. Multiple layer glass reinforcement
3. Epoxy coating seal on all cut ends
4. Molded threads
5. Entry lead for easy make-up
6. Coupling stronger than the pipe
7. Standard O.D. pipe size
8. Wrench ring (optional)

8 Points of Fibercast Superiority

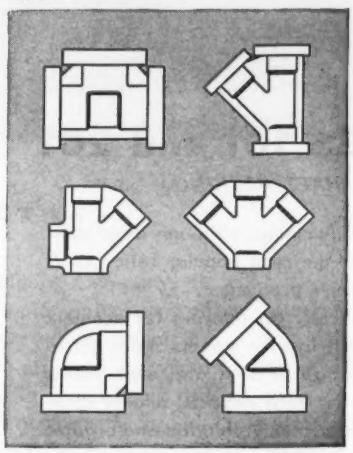
not only for high heat and corrosion resistance, but also for its remarkable maintenance of the purity of the solutions it is required to carry. Such installations range from Fibercast pipes which carry 37% hydrochloric acid at ambient temperatures to lines carrying solutions containing brine, alum, and other sulphates, sulphuric and phosphoric acids, and other damaging chemicals.

Food-processing industries, among the most demanding of all industries in purity, corrosion and heat standards of operation, know the long-term benefits of using Fibercast. Fibercast is especially effective in the processing of foods requiring use of sulphuric and phosphoric acids (such as corn syrup, starches, gelatins), as well as brines and other highly corrosive acids and solutions.

The operating conditions peculiar to the man-made textile and paper processing plants are also improved by the use of Fibercast Pipe and Fittings. The ever-growing demands of all industry . . . the rigid quality controls imposed by governmental and other agencies. . . the unique and often unsolved needs of new processes and methods . . . all of these factors help to create "impossible" problems that can be solved by the use of Fibercast.

Complete Line of Fittings

Fibercast provides fittings to solve any fitting problem. Besides a vast stock of standard sizes and types, Fibercast also designs and makes special fittings to meet individual requirements. All, of course, have the same corrosion, pressure and heat resistance properties of Fibercast Pipe and Tubing. A few of the regularly stocked types are shown in the line drawings below.



If *you* have an "impossible" corrosion, temperature, or pressure problem, consider the advantages of using Fibercast. To receive a free sample of Fibercast, and to get specific information about how Fibercast can help *you*, mail the coupon below.

FIBERCAST COMPANY
BOX 727, Sand Springs, Oklahoma

Please send me further information about Fibercast Tube and Pipe. CP-10A

Name_____

Title_____

Firm_____

Type of Business_____

Address_____

City_____ State_____

FIBERCAST® COMPANY — A DIVISION OF **Youngstown** SHEET AND TUBE COMPANY

Check 5081 opposite last page.

Ductile iron and Teflon proves good combo for plug valves

Units give reliable service under tough conditions

Ductile iron teamed with Teflon is proving to be a good combination for plug valves. Many of these units have passed the "acid test" in chemical plants. One valve replaced a cast iron valve on 12% caustic cell liquor at 70°C. After one year's service valve

Teflon sleeve on Ductile iron plug valve stops sticking and galling, bypasses need for lubrication

is still operating trouble-free. Sticking problem formerly created by mild corrosion deposits and attack of lubricants no longer exist.

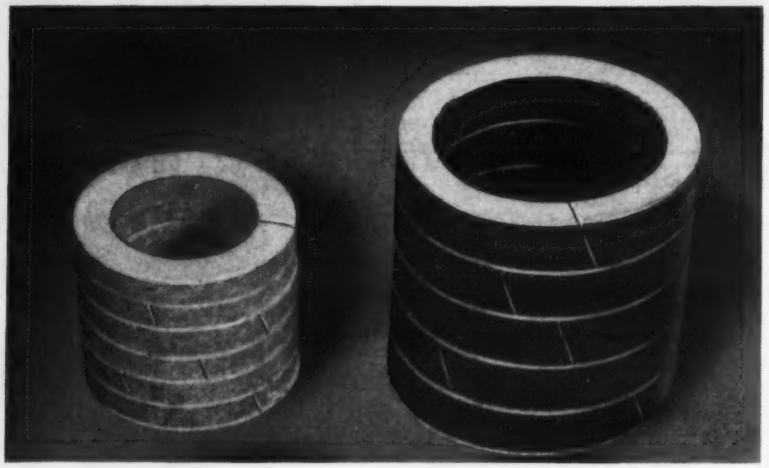
Another valve has been used on ambient temperature chlorine gas at 90 to 100 psi service for over a year. Results have been highly satisfactory.

Explanation for these glowing reports is the high strength and corrosion resistance of the metal combined with the self-lubricating features of Teflon. Valves can be used on water, oil, gas, chemical and other general purpose lines. Teflon sleeves assure positive shut-off with no sticking. Sizes from ½" to 2" are available with either flanged or screwed ends. The larger 3, 4 and 6" valves come in flange design only.

(Type-G Durco sleeveline plug valves are product of The Duriron Company, Inc., 450 Findlay, Dayton 1, Ohio.)

Check 5082 opposite last page.

STILL THE *No. 1* TEFLON* SHAFT PACKING FOR PUMPING CORROSIVES



...CHEMPRO STYLES 101 and 201

(THE ORIGINAL TEFLON SHAFT PACKING)

Chempro Styles 101 and 201 Teflon Shaft Packings, although developed and perfected over 10 years ago, are still the most popular Teflon shaft packings for pumps handling highly corrosive products.

These two stuffing box packings drastically cut packing replacement and maintenance costs. Styles 101 and 201 last for months under corrosive conditions where ordinary packings fail in days and even hours. Successfully seals against bromine, chlorine, butyl extracts, sulphur dioxides, concentrated sulphuric acid, aqua regia, thionyl chloride and organic solvents including halogenated hydrocarbons, etc.

Ideal for use on either centrifugal or reciprocating pumps, at speeds up to 3600 R.P.M. and at temperatures ranging from —118°F. to +525°F.

STYLE No. 101 — Compounded of approximately 94% shredded Teflon and a graphite friction reducer, molded into packing rings.

STYLE No. 201 — Same as No. 101 except that mica is used as the friction reducer.

Both styles are made in sizes to fit any stuffing box. Supplied in ring sets for specific equipment or in single quantity ring orders.

Write for Chempro Bulletin CP 552.

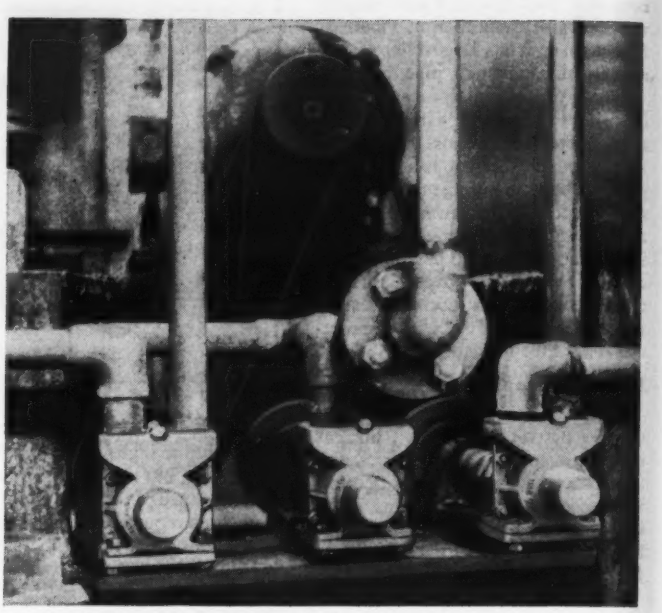
*duPont Trademark

CHEMICAL & POWER PRODUCTS, INC.
9 Broadway, New York 4, N. Y.

The Original Fabricators of Teflon Packings and Gaskets

Check 5083 opposite last page.

CORROSION CONTROL



Single motor fitted with three belts drives three pumps. Units all have Teflon impellers

Handling nitric acid, tributyl phosphate and kerosene under demanding conditions . . .

Small pumps do a man-size job in A-fuel plant

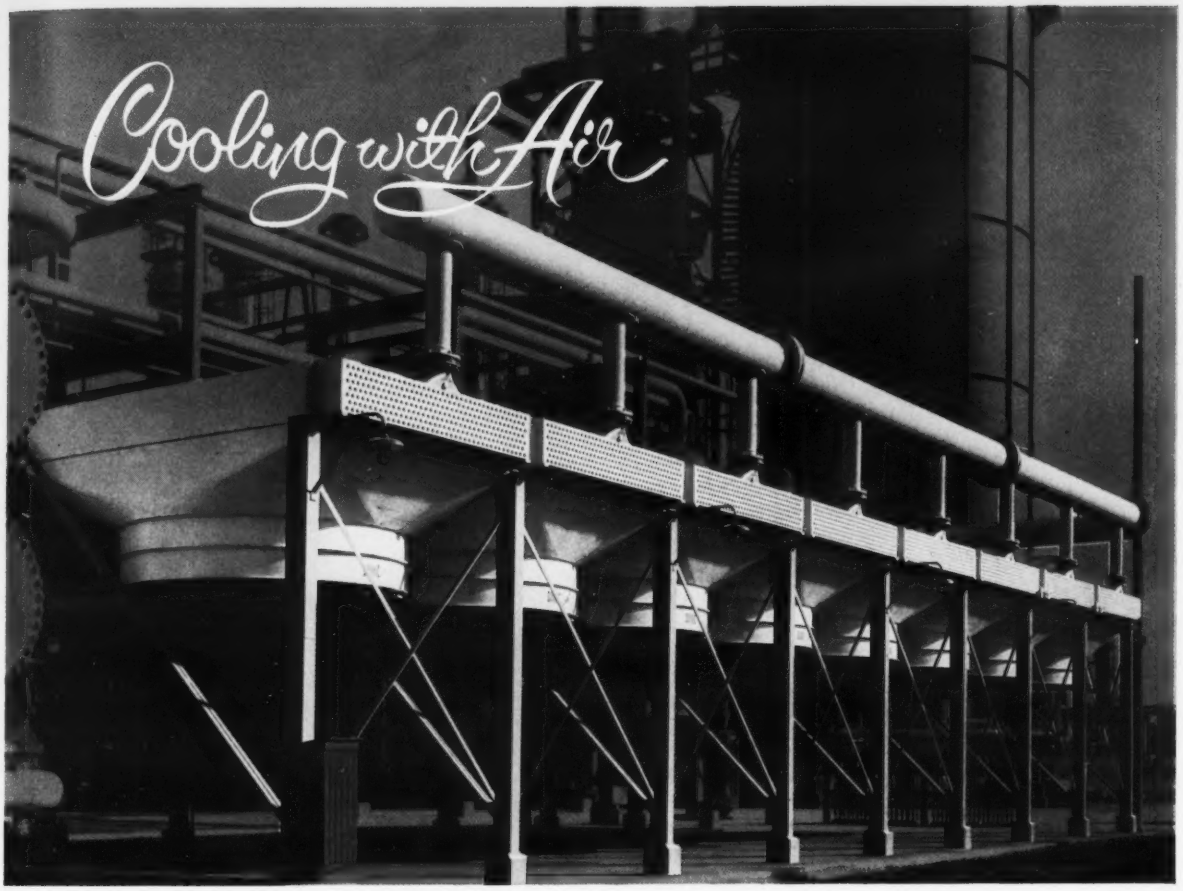
Little pumps can play big roles in chemical plants. Although the volumes handled may be small, they often are extremely important.

Case in point is the nuclear fuel plant of Mallinckrodt Nuclear Corporation, St. Louis, Missouri. Here, a group of three midget-size pumps are continuously feeding relatively small amounts of tributyl phosphate, kerosene and 3N nitric acid into big countercurrent extraction equipment. Accurate and reliable pump performance is a must. Proper proportions and constant flow rates are absolutely necessary if peak efficiency is to be maintained in the overall operation.

Although the acid is extremely corrosive and the tributyl phosphate is exceptionally difficult to contain, the pumps are performing fine under these rough conditions.

Secret of success lies in their design and construction. Corrosion resistance is provided by Teflon impellers and bearings, assisted by 304 stainless-steel pump housing and shaft. Teflon and halocarbon packings also contribute in this respect.

A single motor fitted with three belts drives all three units. Pump's patented design provides linear flow. Each unit has two impellers generating overlapping delivery. Sleeve bearings are lubricated by fluid being pumped, bypassing need for periodic lubrication and eliminating danger of product contamination. Pumps are reversible in operation. All pump parts are of standardized precision manufacture and can be easily interchanged



IN THE BAYWAY REFINERY...

of the Esso Standard Division of Humble Oil and Refining Company.

The above pictured installation of HUDSON Solo-aire units obviated costly addition to the existent and comparatively high-maintenance-cost water system.

Over-all economic comparisons of HUDSON Solo-aire cooling versus water cooling almost invariably result in selection of Solo-aire units for much or all process cooling.

In two complete 40,000 barrel seaside refineries constructed abroad, Solo-aire units are used for ALL process cooling services. NO WATER IS USED FOR PROCESS COOLING.

In the United States in a 40,000 barrel refinery built adjacent to an unlimited water supply, 50% of the total dissipated heat is transferred directly to air through Solo-aire units.

Operating results of thousands of HUDSON Solo-aire units installed in oil, gas and chemical plants throughout the free world have established HUDSON leadership in the field of direct cooling with air.

ONLY HUDSON designs and manufactures ALL THREE categories of cooling equipment . . . for cooling solely with air (Solo-aire); for cooling primarily with air but with minimum water to obtain low effluent process stream temperatures (Combin-aire); and water cooling towers. Take advantage of HUDSON'S objective assistance in selecting the integrated cooling system which best balances capital investment and operating cost for the specific process, climatic, and water conditions.

HUDSON

ENGINEERING CORPORATION

BRAEBURN STATION • HOUSTON, TEXAS

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AT COSDEN . . .

After five years' experience in operating Combin-aires, Cosden Petroleum Corporation, at its Big Spring refinery, has installed its FOURTH Hudson Combin-aire.

The Combin-aire is an integrated structure combining a water cooling tower with fin-tube hot fluid to air exchangers. Ambient air is cooled as it is drawn thru the water, and the cooled air serves as the cooling medium for the fin-tube coolers. Thus, with fin-tube coolers, effluent process stream temperatures may be reduced far below those obtained with ambient air.

The Combin-aire may be used primarily as a cooling tower, with the advantages of double use of air, and complete elimination of spray carry over or condensation because of under-saturation of the hot effluent air. Or when water is scarce, or salt, or brackish the Combin-aire may be used primarily for fin-tube cooling, using minimum water of any quality for pre-cooling air.

DEPENDING UPON DESIGN OBJECTIVES THE COMBIN-AIRE MAY HAVE SOME OR ALL OF THE FOLLOWING ADVANTAGES:

- Absolute minimum water consumption consistent with attainment of low terminal process stream temperatures.
- Water circulation may be made automatically responsive to air temperatures with no water circulated except at high ambient temperature.
- No water treatment necessary. Salt water or brackish water may be used.
- No spray carryover or condensation. After passing across the fin-tube elements the heated air leaving the Combin-aire at elevated temperature is undersaturated with water vapor and cannot precipitate condensate or carry water spray.
- Minimum piping. Combin-aire may be installed immediately adjacent to other process equipment.
- Clean air to fin-tube units. During the hot season water is washed, removing dust, sand and insects.

Effluent temperatures of process streams may be accurately controlled with HUDSON Auto-variable pitch fans.

HUDSON

ENGINEERING CORPORATION

BRAEBURN STATION • HOUSTON, TEXAS

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with new parts in the field, should repairs be necessary.

Pumps of this type can handle up to 10 gpm water at 1750 rpm. They are available in 304, 316 and Carpenter 20 stainless steel and in Hastelloy B and C.

Units can handle non-abrasive and non-lubricating as well as lubricating fluids in viscosities up to 220 cps. Pumps are self-priming with most liquids.

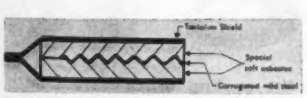
(Allchem rotary pumps are product of Eco Engineering Company, 12 New York Avenue, Newark 1, New Jersey.)

Check 5084 opposite last page.

Tough service conditions are duck soup for tantalum gaskets

Tantalum-shielded gaskets are available that can be used in highly corrosive environments at temperatures to 700° F and pressures to 1000 psi. Designed primarily for use with tantalum-lined vessels at temperatures in excess of 500°F, gaskets consist of two tantalum shields welded together at the ID to form an envelope.

Within envelope, a layer of corrugated steel is sandwiched between two layers of asbestos. This forms compressible center which has necessary resilience to prevent leakage.



Gaskets consist of two tantalum shields welded together at ID to form an envelope

Corrugated steel and asbestos never come in contact with corrosive medium being handled.

Individual tantalum washers are 0.02" thick and welded together. The gaskets are designed to fit standard nozzle and manhole openings from 1" to 36". Tantalum has virtually

For more information on product at left, specify 5085 . . . see information request blank opposite last page.

LOCKS 'EM IN OR OUT -LONGER

NEW LATEX FOR COATING

RESYN® 3600

POLYVINYLIDENE CHLORIDE

RESYN 3600 is a water dispersed polyvinylidene chloride that promises a revolution in protective coatings. For the first time, it combines exceptional barrier properties with simple low cost application by high speed coating machines or spraying. It offers important new advantages:

MOISTURE—Moisture vapor transmission is 2½ to 5 times lower than that of polyethylene. **ODORS**—Resistance to transmission of common gases 1000-2000 times greater than polyethylene. **CHEMICALS**—Almost complete non-reactivity to concentrated acids, solvents, alkalies and other corrosive materials. Grease and oil penetration is nil. Fire retardancy is excellent.

RESYN 3600 can be coated on paper, paperboard, plastic and other substrates. It also may be applied to fibers. It is of interest to a broad range of industries, including food and other types of packaging, converting, chemical, and textile.

Experimental lots of RESYN 3600 are now available. A 14 million lb. plant will be on stream this fall. Write for information.

National RESINS

NATIONAL STARCH and CHEMICAL CORPORATION

750 Third Avenue, New York 17 • 3641 So. Washtenaw Avenue, Chicago 32 • 735 Battery Street, San Francisco 11

And All Principal Cities in the United States, Canada, England and Mexico

Check 5086 opposite last page.

zero corrosion rate in many corrosive environments. It is attacked by hydrofluoric acid and alkaline solutions above pH of 8.

Unlike glassed steel, tantalum is susceptible to corrosion in fuming sulfuric acid, chlorosulfonic acid and SO_3. However, it is more resistant than glassed steel in high temperature service.

(Further information about tantalum-shielded gaskets may be obtained from The Pfaudler Co., Div., of Pfaudler Permutit Inc., 1111 West Ave., Rochester, N.Y.)

Check 5087 opposite last page.

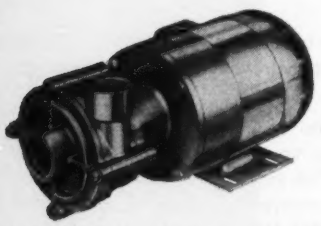
Pump has no bearings, can withstand tough corrosive service

Uses: Transferring corrosive liquids.

Features: Pump is lightweight and has no bearings. Motor is encased in aluminum.

Description: Centrifugal unit is designed for continuous duty. With 1″ outlet, pump will deliver up to 33 gpm at pressures up to 28′ of head.

Pump body, face plates and impeller are made of corrosion-resistant plastic. Parts can be made from any material capable of being injection-molded. Shaft and couplings are type-316 stainless steel. Neoprene O-ring is used. Rotary mechanical seal requires little or no maintenance.



Lightweight centrifugal pump has motor encased in aluminum

(Pump is product of Houston Fearless Corporation, 11835 West Olympic Boulevard, Los Angeles 64, California.)

Check 5088 opposite last page.

ENGINEERED TEFLON* PRODUCTS
for Chemical Processing

Processors find it good practice to apply Garlock Teflon Packings and Seals against hot, reactive chemicals.

Garlock LATTICE-BRAID† Teflon Packings are strong, long-lasting, chemically inert. Withstand temperatures ranging from −120°F to +500°F. Extremely effective in reducing maintenance . . . require less gland pressure to effect an adequate seal. This results in longer sleeve and packing life, less downtime. Because of the interlocking braid construction, LATTICE-BRAID Packings will hold together far beyond the limits of other packings. Catalog AD-131.

Garlock CHEMISEAL† Mechanical Seals possess greater immunity to corrosion and are more economical than most other designs offered. Easy to handle and install, do not score shafts, engineered for long life. Available in standard sizes to fit all pump shafts ⅞″ to 2⅛″. Seals against most corrosive media at pressures to 100 p.s.i. at 75°C or 75 p.s.i. at 100°C. Catalog AD-164.

Garlock Teflon-jacketed Gaskets give you the advantage of using Teflon without sacrificing resiliency and deformability . . . particularly important on your glass-lined process equipment, light metal flanges, and glass pipe flanges and fittings. Garlock offers four basic designs—slit envelope, milled envelope, formed shield, double jacket—and a wide selection of filler materials and thicknesses. Catalog AD-154.

Garlock Solid Teflon and Teflon-lined Expansion Joints guard costly piping against sudden pressure surges . . . reduce flange breakage, prevent stress, compensate for misalignment. Solid Teflon Expansion Joints can be used against solvents, acids and caustics to 75 p.s.i. Teflon-lined Expansion Joints are recommended for pressures from 60 p.s.i. to 125 p.s.i. depending on pipe size. Catalog AD-137.

GARLOCK

Discuss the sealing of corrosives with your local Garlock representative—he will be glad to offer suggestions and other application assistance you may need. For prompt service, call him at one of Garlock's 26 offices and warehouses throughout the U.S. and Canada. Or, write Garlock Inc., Palmyra, New York.

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Company

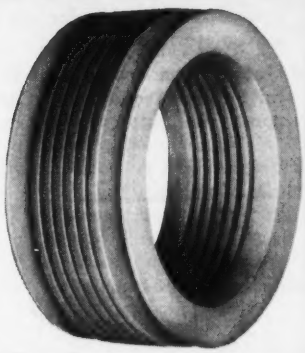
Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded & Extruded Rubber, Plastic Products

†Registered Trademark
*DuPont Trademark for TFE Fluorocarbon Resin

CHEMISEAL Mechanical Seals are in wide service on rotary shafts of equipment like reaction vessels and pumps.

LATTICE-BRAID Teflon Packings are used for rotary and centrifugal shafts, valve stems, and reciprocating rods, rams, plungers.

Solid-Teflon and Teflon-Lined Expansion Joints protect piping from pump, compressor, engine and pressure surges.



Teflon-jacketed Gaskets prevent leakage in glass-lined process equipment, light metal flanges, glass pipe flanges and fittings.

For more information on product at left, specify 5089 see information request blank opposite last page.

Merger Announced—

INTERNATIONAL Process Equipment Company
Now Operates as a Division of
The **Patterson** Foundry and Machine Company
with All Manufacturing, Sales and Management Activities
Centralized at East Liverpool, Ohio
BETTER SERVICE FOR OUR CUSTOMERS!

NEW Belt-Driven Mills

NEW
NEW

- Quick-Acting, Precision-Fit Doors (Round or Square)
- Unique Machined Short Trunnions, Adjustable for End Play
- Rigid, Fabricated Heads and Frame

Here's a new measure of economy, *plus profitable grinding,* International Belt-Driven Mills incorporate many design features not before available—for example, Type BD can be furnished with internal teeth on the main gear ring for better protection from dirt.

Type BD—with optional internal teeth on main gear.
Type SM—with torque arm belt drive.

INTERNATIONAL
PROCESS EQUIPMENT COMPANY DIVISION

AGITATORS • MIXERS • DRY BLENDERS • EXTRUSION MACHINES • FANS and other PROCESS EQUIPMENT

Check 5090 opposite last page.

CORROSION CONTROL

Free radical inhibitors may solve aerosol corrosion problem

Experiments throw light on troublesome phenomenon

Studies have shown that container corrosion occuring in many nanaqueous aerosol products containing ethyl alcohol and propellent-11 (trichloromonofluoromethane) is primarily due to reaction between those two chemicals rather than hydrolysis of the propellent as has long been supposed.

The problem has kept many aerosol formulations from getting past the laboratory stage and has cut shelf life of many pressurized products.

Discounting the theory that corrosion was caused by acidity created by reaction of trichloromonofluoromethane with moisture, experiments have shown hydrolysis is slight and probably of little importance.

Major cause of corrosion is hydrochloric acid, formed in a free-radical reaction between the propellent and ethyl alcohol. Solution to problem is seen in use of free radical inhibitors, several of which have been found to be successful and suitable for use in aerosol formulations.

(Information courtesy of E. I. du Pont de Nemours & Company, Willington, Delaware.)

"Can't you ever stop being the chemical engineer?"

we see

EYE TO EYE

when it comes to sealing service . . .

YOU WANT

- lowest original cost compatible with dependable service
- a sealing service with the least maintenance cost
- long term sealing with the very minimum "down time"
- a line of mechanical seals designed to meet the widest range of applications

WE WANT

- the opportunity of showing you that this, *and more,* is yours when you meet your sealing needs with . . .

DURA SEAL

"The Engineered Mechanical Seal"

We suggest you write us today for a copy of Dura Seal catalog No. 480 CP

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO, MICHIGAN

Check 5091 opposite last page.

HIGH PRESSURE GAUGES
USED IN REFINERIES AND CHEMICAL PLANTS THROUGHOUT THE WORLD
THRU VISION
REFLEX
Single or Multiple Sections
TUBULAR
Gauge Cocks
•
Large Chamber Reflex Gauges
•
Heated or Cooled Gauges
SEND FOR COMPLETE CATALOGUE
STRAHMAN VALVES, Inc.
NICOLET AVE., FLORHAM PARK, N. J.
Check 5092 opposite last page.

CORROSION KEYS

Teflon Fluorocarbon Resins

CHARLES H. LANGRALL
Polychemicals Department
E. I. du Pont de Nemours & Company

"Corrosion Keys" are copyrighted (1960) *by Putman Publishing Company*

Few engineering materials can match the Teflon fluorocarbon resins for combined properties of resistance to chemical attack and high-temperature performance. Teflon TFE (tetrafluoroethylene) resins and the new Teflon 100 FEP (fluorinated ethylene propylene) resin are inert to all industrial chemicals and solvents with the exception of molten alkali metals, fluorine and related compounds (e.g., ClF_3) at elevated temperatures and pressures.

They are rated for continuous service at temperatures well above those where most plastic materials undergo serious degradation—at 500°F for TFE resins and 400°F for FEP resin. The Teflon resins, moreover, retain useful tensile, flexural and other physical properties over broad ranges of environmental conditions, including the ability to withstand temperatures up to even 1000°F for short periods of time.

A measure of the performance of Teflon fluorocarbon resins in corrosive service is provided by the attached Corrosion Keys. Data were obtained from both laboratory and actual-service performance of representative constructions. Owing to practical considerations, data for many chemicals are limited.

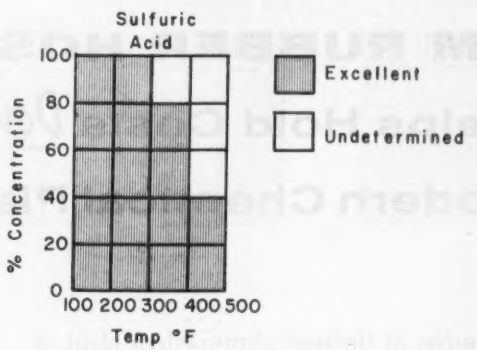
Where data are available, the ratings are based on retention of structural properties, or the ability of the resins to perform as intended. While changes in tensile strength, elongation and hardness are evident in some cases, the average performance in every chemical is consistently excellent. These results indicate, therefore, that satisfactory performance can be expected well beyond the range of concentrations and temperatures which comprise the existing data.

Depending on the quality of fabrication and the conditions of exposure, Teflon fluorocarbon

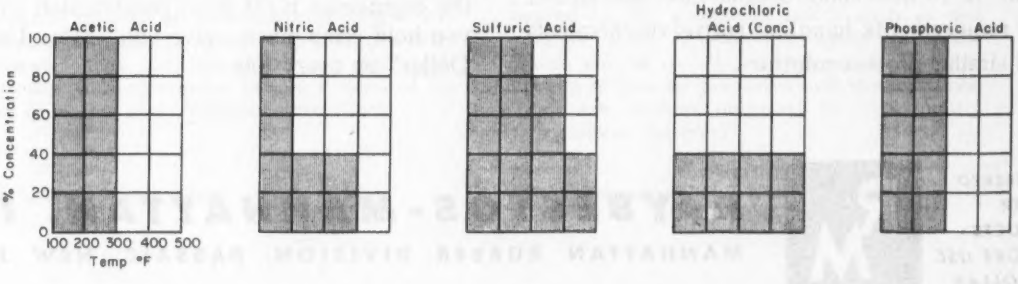
To page 129

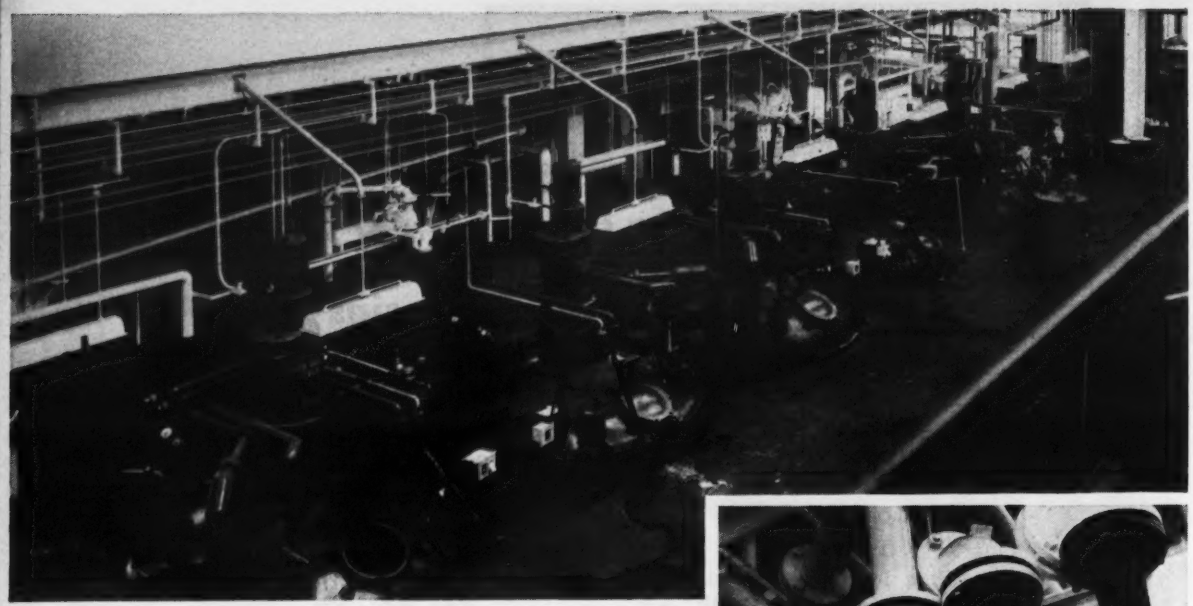
CODE

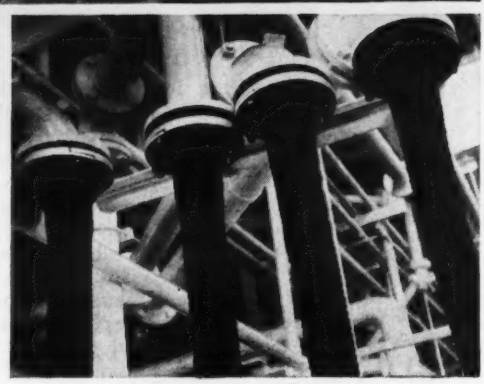
Teflon TFE



Teflon TFE







R/M RUBBER HOSE
Helps Hold Costs *Down*
in Modern Chemical Plants

For example, at the new ultra-modern plant of Toms River—Cincinnati Chemical Corporation at Toms River, New Jersey—R/M custom-engineered hose saves manhours and protects vital processes. That's because R/M engineering made certain the *right* hose was made and supplied for each process function. Typical are the lines on the huge Manhattan rubber lined kettles shown above. The lengths of hose at right are specially engineered and equipped with leak-proof Hydro-Lok flanges to overcome process pipe-line problems. Throughout the Toms River plant, R/M hose constructions meet specialized job requirements handling corrosive chemicals and similar process solutions.

You can expect the same "engineering" with the R/M hose you specify for your plant. Easy handling Homoflex is ideal for wash-down operations, or wherever you use air or water hose for general service. For handling chemicals and acids, there's R/M Teflon Lined Hose and Condor Acid Hose available with rubber, neoprene, Butyl or Hypalon tube as required for specific conditions. Condor Flexible Pipe can outlast iron or steel as much as 10 to 1 for highly abrasive or corrosive solutions. R/M Rubber Expansion Joints will eliminate pipe-line stresses, misalignment and vibration.

Depend on your R/M representative to suggest the engineered R/M hose construction to help you hold costs down—give you "More Use per Dollar" on every job.

RM 1011

ENGINEERED RUBBER PRODUCTS ... MORE USE PER DOLLAR

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY

Check 5093 opposite last page.

Corrosion indicators of thin-film metal prove reliable

Highly-sensitive, thin-film metal indicators are helping to slash product damage caused by corrosive conditions inside packages and storage areas. The recently developed devices are comparable in cost to those of silica gel-type indicators, but provide much more reliable data.

The units consist essentially of thin metal films (less than a few millionths of an inch thick) vacuum-deposited on nonmetallic substrates. Corrosion can be detected either visually or by change in electrical resistance. As corrosion proceeds, the metal film changes from a silver gray to a rust color. Electrical resistance increases as this change takes place. High sensitivity insures complete corrosion of the indicator before damage begins to occur to the protected part or component being stored.

Several types of visual indicators have been developed. One consists of a 1" x 3" x 0.010" strip of translucent Mylar onto which is deposited a sensitized iron surface. The strip is stapled downward against the card.

Another is a small plastic sheet which folds like a matchbook. The sensitized iron film is placed on inside surface of matchbook. Label and instructions are on cover. The indicator is small and inexpensive. A window-type indicator that can be mounted in the package wall has also been developed.

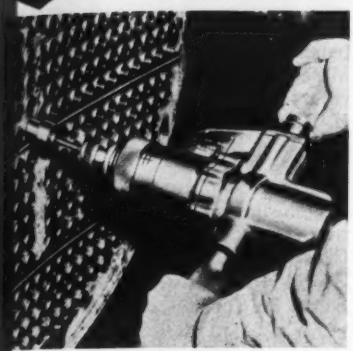
Electrical devices are used where visual indication is not feasible. These are for use in hermetic feed-through connectors mounted on package wall. Increase in electrical resistance can be followed by either manually-operated or automatic instruments.

Films of iron were found to be most suitable for packaging and storage applications. Manganese, calcium, strontium, copper, nickel, cobalt, zinc and magnesium were also studied. Both glass and

To page 130

AIRETOOL

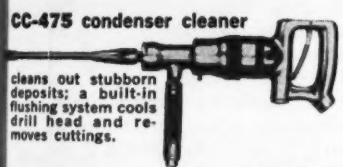
job-fitted pneumatic tools for better tube maintenance . . .



Proper tube fabrication and maintenance depend on the right equipment for each job. And Airetool's complete line of air-powered tools and accessories are job-fitted to specific needs; to cut down time, boost in-service life and speed tube repair and replacement.

AIRETROL (illustrated above). Positive, automatic tube expansion control that's accurate within .001 inch. Rolls up to 12 tubes a minute.

CC-475 condenser cleaner



cleans out stubborn deposits; a built-in flushing system cools drill head and removes cuttings.

INTERNAL TUBE CUTTER with positive feed control for cutting tubes of 12 to 20 gauge.

EXPANDING BRUSH HEAD CLEANER

with flexible shaft and universal joint for tubes with short bends. Motors and cleaners for every tube size.

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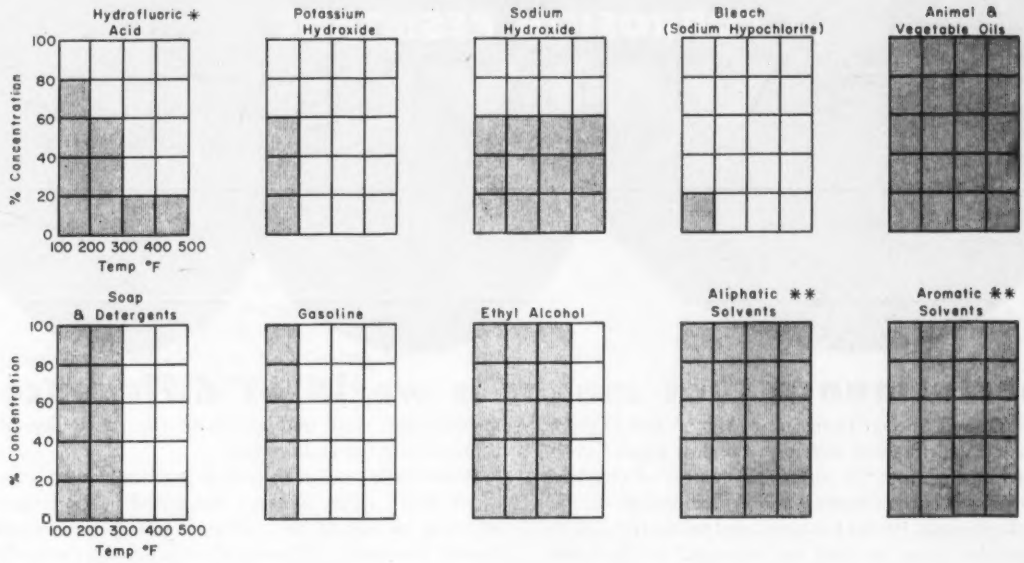
CORROSION KEYS: Teflon *From page 127*

Teflon TFE



resins in the presence of certain media may exhibit such effects as absorption, permeability or blistering.

Absorption

To a minor degree, halogenated organic solvents are absorbed by Teflon resins. Carbon tetrachloride at 300°F and 75 psig will cause a weight increase of one to three per cent; some perfluorocarbons under similar conditions may lead to a weight increase as high as 10 per cent. Such weight changes, accompanied by slight swelling, may in extreme cases resemble the initial stages of chemical attack observed with less inert plastics.

With Teflon resins, however, the action is strictly physical, and removal of the absorbed material restores all original properties of the resin. Absorption to a higher degree generally indicates that the fabricated part has high porosity, although other factors controlled by the processor may influence this effect.

Permeability

Permeability of Teflon resins to most chemicals is normally quite low — comparable to neoprene and butyl rubber. When used as a barrier against highly corrosive media, thicknesses of 30 to 60 mils or greater are normally recommended. Permeability, like absorption, is influenced by porosity of the fabricated part.

Blistering

Porous moldings of Teflon resins will sometimes show blistering and other forms of structural degradation when subjected to certain process conditions. Blistering results primarily from the expansion of gases captured in surface pores. A more serious form of deterioration is caused by the growth of solids such as salt crystals, from solutions entrapped in voids. These effects usually accompany wide-range cycling of process pressures and temperatures. They are seldom observed in high-quality fabrications, however. *To page 131*

*100% HF has no effect at 78°F

**Some halogenated solvents will cause moderate swelling

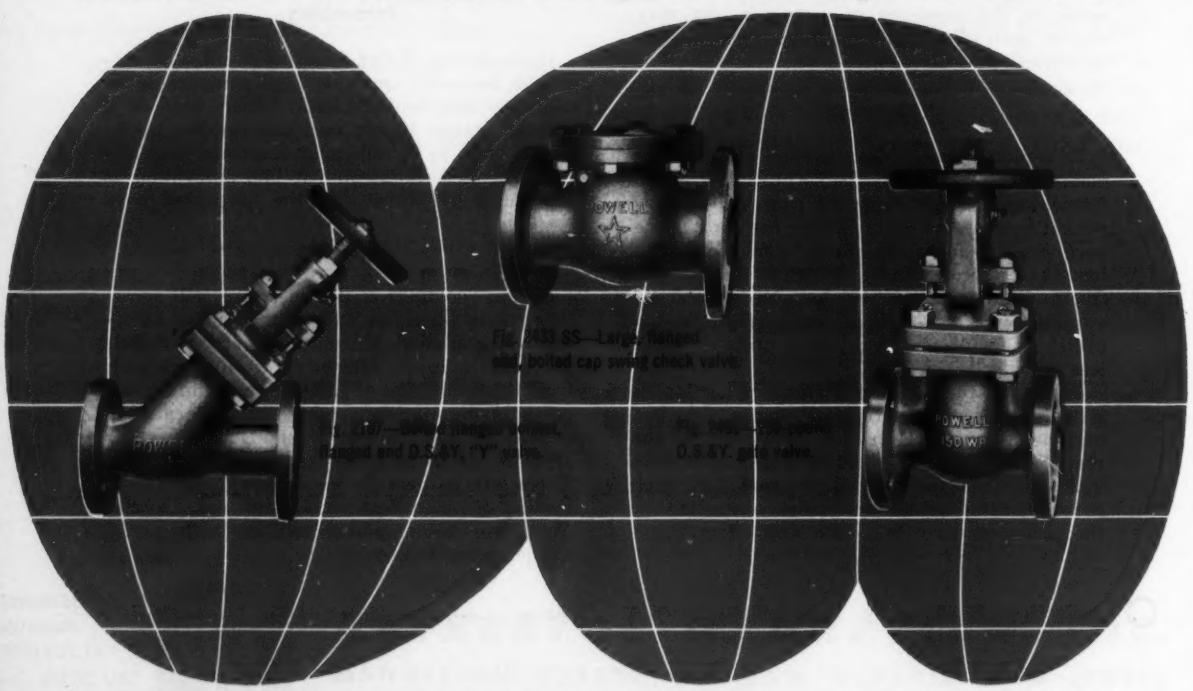
performance that makes a world of difference

The Powell Special Design and Alloy Valve Division was created to study and solve the flow control problems arising from the increasing number of corrosive fluids used in the Chemical and Process industries.

As a result, Powell has developed valves that can be depended upon for long, uninterrupted service under the most corrosive conditions; valves that require little maintenance; and that eliminate the possibility of contamination of end product.

Powell offers valves to handle practically every corrosive fluid—valves of every design and in the largest selection of metals and alloys. Contact your local Powell distributor. Or write or call us direct. Our consulting engineers are at your service.

Powell . . . world's largest family of valves



THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

Check 5095 opposite last page.

From page 128

plastic substrates were investigated.

Use of the indicators for detecting ozone, water in jet fuels, packaging and storage of hardware and atmospheric pollution detection are also considered practical.

(Condensed from technical paper, "Development of Thin Metal Film Corrosion Indicators", by D. Roller and G. H. Rohrback, Magna Products, Inc.)

(Further information about MagnaFilm corrosion indicators may be obtained from Crest Instruments, 11808 South Bloomfield Avenue, Santa Fe Springs, California.)

Check 5096 opposite last page.

Curing temperatures affect epoxy resins chemical resistance

Recent tests have shown that chemical resistance of many resins are greatly influenced by their thermal stability. For example, modified Furane Epocast X5B when cured at low temperatures, is just another surface coating material. However, when cure temperature is raised to 325-350°F, the film is highly resistant to chemical attack and provides good protection to substrates — even from fuming nitric acid.

In an attempt to determine degree to which epoxy coating systems resist chemical attack, one of the studies made compared thermal properties of coating formulations with ability to resist moisture penetration.

Escalator-type hardeners were used so that various degrees of hardness could be obtained. Evaluation was based on Shore Durameter hardness at room temperature, 200-300°F, after 30 days in water, water absorption after two-hour boil, and tensile lap shear with aluminum panels.

Stoichiometric ratios were varied below and above desired optimum. Smaller amounts of hardener simply left unre-

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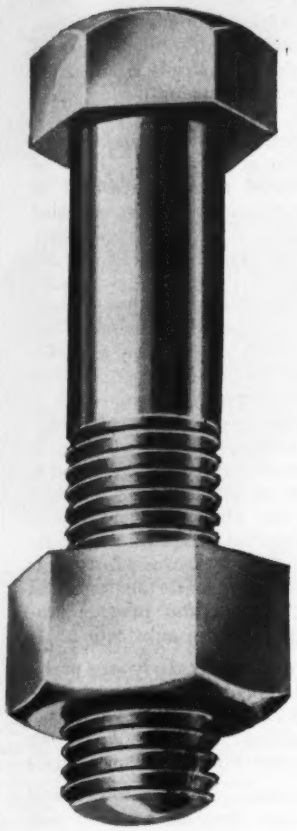
Uniform Class 3 Fit

BOLTS·NUTS·STUDS



• TITANIUM • STAINLESS STEELS
• CARBON STEELS • SILICON BRONZE
• ALLOY STEEL • NAVAL BRASS
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You can depend on a uniform Class 3 fit if required when you buy Pawtucket threaded fasteners. Standard items or specialties — all Pawtucket products are accurately made in standard dimensions or to your specifications. Heat treating with precision-controlled modern equipment.

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THE PLACE TO SOLVE YOUR BOLT PROBLEMS

"The Bolt Man" T.M. REG.

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OCTOBER 1960

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CORROSION KEYS: Teflon *From page 129*

For the most part, all such effects can be minimized or eliminated in the fabrication stage. Since proper design and fabrication are important in attaining rated performance, it is recommended that manufacturers be consulted on the requirements of specific applications. Data for the Corrosion Keys were obtained with parts fabricated to properties optimum for chemical service.

Fabricated forms of Teflon resins currently available to the chemical industry include process piping (steel pipe lined with Teflon TFE resins), hose, valve and pump components, filters, piston rings, bearings, seals, gaskets, packings, a pipe-thread sealant and laboratory equipment.

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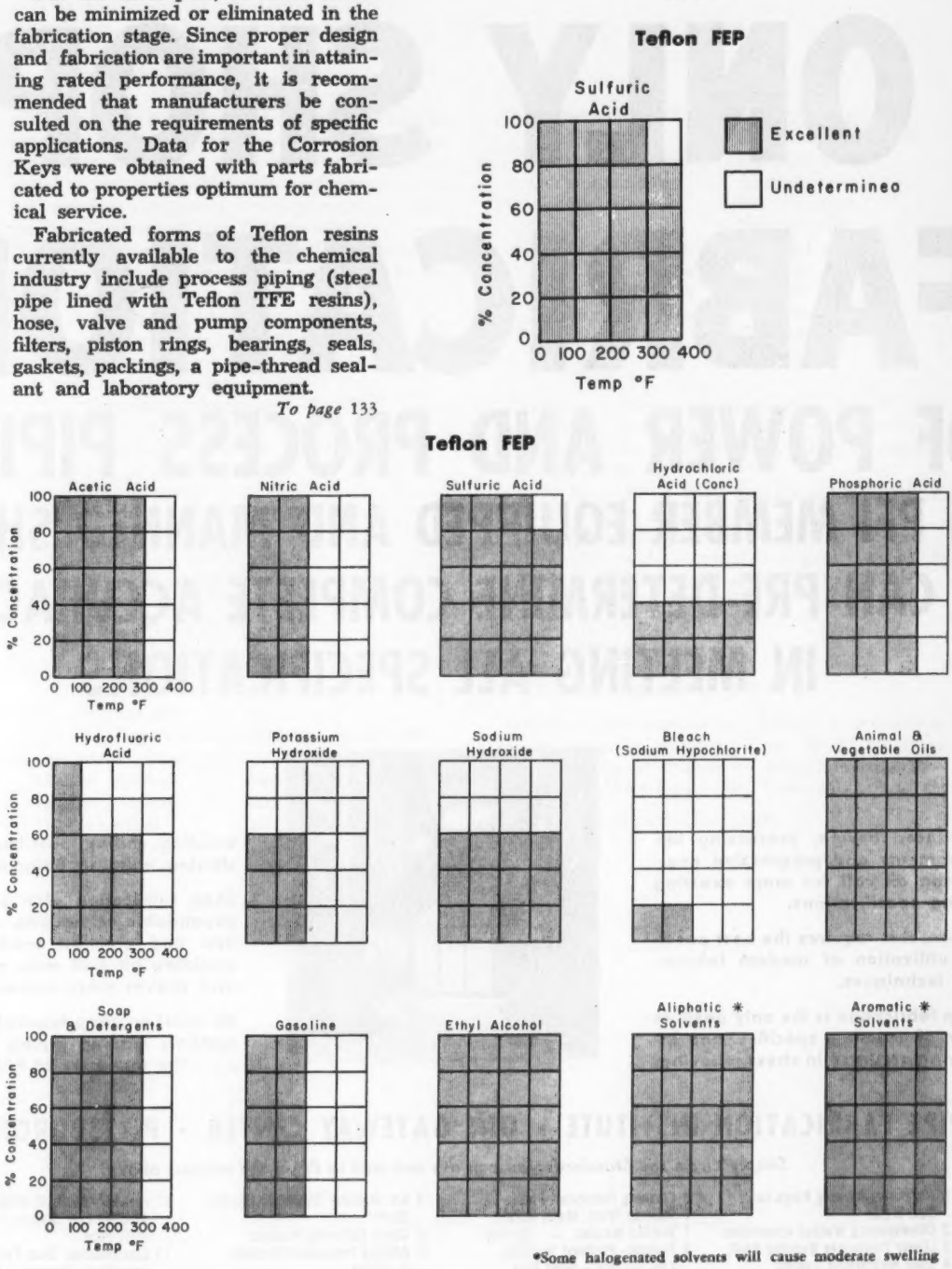

*Some halogenated solvents will cause moderate swelling

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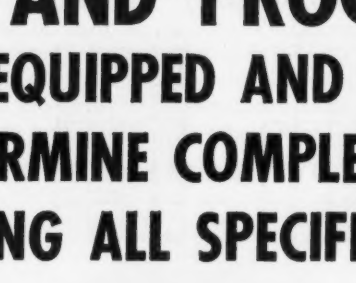
ONLY SHOP FABRICATION OF POWER AND PROCESS PIPING IN PFI MEMBER EQUIPPED AND MANNED SHOPS CAN PRE-DETERMINE COMPLETE ACCURACY IN MEETING ALL SPECIFICATIONS



Advanced design, processing improvements and progressive engineering all call for more exacting piping specifications.

In turn, this requires the best possible utilization of modern fabrication techniques.

Shop fabrication is the only positive way of meeting specifications involving accuracy in stress relieving, bending, coiling, post-heating, vanstoning, welding, fitting and testing.

Shop fabrication also assures the dependable scheduling of installation and erection work and, by avoiding hit and miss methods, it also proves more economical.

So insist on shop fabrication by the nation's leading piping specialists . . . the members of PFI.

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Simply circle the Standards you can use and mail to PFI at the address above.

1 Machining Backing Rings for Butt Welds
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4 Shop Hydrostatic Testing
5 Cleaning Fabricated Piping
6 Built-up Weld, Metal Bosses
7 Welded Nozzles — Spacing
8 Preheat - Postheat Welding, Low Chrome — Moly Pipe
9 Arc-Welding Dissimilar Ferritic Steels
10 Stress Relieving Practices
11 Affixing Permanent Symbols to Piping
12 Preheat - Postheat Welding, Medium Low Chrome — Moly Pipe
13 Classification, Shop Testing, Inspection, Cleaning

Check 5098 opposite last page.

From page 130

acted oxirane groups that did not adversely affect water-resistance and adhesive strength. Conversely, excess amino groups demonstrated marked sensitivity to moisture. Lap shear strength was cut in half.

Noticeable drop in Shore D hardness readings, both at elevated temperature and 30 day water exposure, indicated that a relationship definitely exists between thermal and chemical properties. Results reveal that complete factorial design experiments are impractical. Long time exposure tests are almost equally so with regards to screening of experimental coating systems.

However, measurement of surface or penetration hardness of test coupons exposed to the elements certainly is warranted. Exposure at various temperatures indicates ability of materials to resist degradation and provide protection to the substrate.

(Condensed from paper, "Chemical Resistance of Plastics As Influenced by Thermal Stability", by W. J. Dewar, Furane Plastics Incorporated.)

(Further information about Furane Epocast coatings may be obtained from Furan Plastics Incorporated, 4516 Brazil Street, Los Angeles 39, Calif.)

Check 5099 opposite last page.

WANTED: NOMOGRAPHS — WORTH $20 EACH!

Do you have a pet nomograph that could save time for other CHEMICAL PROCESSING readers? If so, send it neatly and accurately drawn, with a double spaced, typewritten description to:

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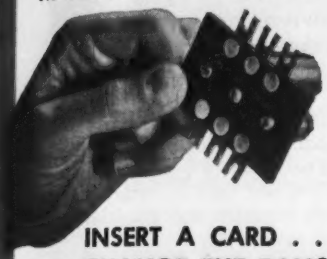
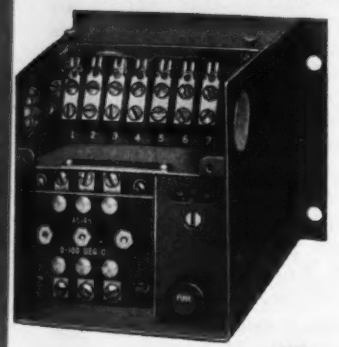
We will pay $20 for each one accepted and published.

Great things are happening in AutroniC® Control



INSERT A CARD . . .
CHANGE THE RANGE



LOW-COST, HIGH-PERFORMANCE ELECTRONIC RESISTANCE THERMOMETER

Pick a temperature range between —50° and 700°F., or —50° and 350°C.; place the corresponding range card in the Swartwout thermometer adapter, and the temperature range is set up, ready to go.

Simple? You bet. Simplified design is the reason for the low price of the Swartwout Resistance Thermometer. It is also the reason for the unit's exceptional dependability.

Highly sensitive, the fully-electronic Swartwout Resistance Thermometer temperature system is adaptable to full-scale temperature spans as small as 3°F. It can indicate, record, or control. With slight modification, or auxiliary equipment, it will add, subtract or average temperature . . . even control the ratio between two temperatures, or between temperature and another variable.

All this is done with electronic speed. Data is transmitted instantaneously . . . no time-lag no matter where temperature elements are located.

The operational ease, functional flexibility and simplicity of the Resistance Thermometer are characteristic of the entire line of Swartwout AutroniC Instrumentation.

For details on the Resistance Thermometer, request Bulletin A-706-B.
SWARTWOUT DIVISION, CRANE CO., Hooksett Ind. Park, Manchester, N. H.

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E.A. 1998

Check 5100 opposite last page.

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CORROSION KEYS: Teflon *From page 131*

The improved ease of fabrication offered by the new Teflon 100 FEP resin, which can be molded and extruded in the manner of conventional plastics, greatly enhances the outlook for new and significant developments in chemical applications of the Teflon resins.

Teflon TFE and Teflon 100 FEP fluorocarbon resins are also unaffected by exposure to the following media:

Acetic anhydride at 300°F
n-butyl amine at 300°F
Cyclohexane at 300°F
Dioctylphthalate at 300°F
Dimethylformamide at 300°F
Ethylene glycol at 300°F
Tricresyl phosphate at 300°F
Br_2 at 200°F
Cl_2 at 200°F
$KMnO_4$ (5%) at 200°F
H_2O_2(90%) at 150°F
Na_2O_2 at 200°F
$ClSo_3H$ at 200°F
Ozone at 78°F
NH_3 liquid at 78°F
PCl_5 at 200°F

Or to the following rocket propellants:

Nitrogen tetroxide
Hydrazine
Unsymmetrical dimethyl hydrazine

Or to these reagents at their boiling points:

Benzyl alcohol	Naphthols
Higher alcohols	Ethyl acetate
Diethyl ether	Ethyl hexoate
Higher ethers	Dibutyl sebacate
Acetone	Di-isobutyl adipate
Methyl ethyl ketone	Other esters
Cyclohexanone	Aniline
Acetophenone	Nitrobenzene
Other ketones	Benzonitrile
Trichloroethylene	Benzoyl chloride
Perchloroethylene	Dioxane
Hexachloroethane	Furane
Other halogenated hydrocarbons	Pyridine
Phenol	Piperidene
	Cresols

Typical process environments handled by pipe lined with Teflon TFE resins include:

H_2SO_4 (35%), $(NH_4)_2SO_4$ (27%) organic sludge at 212°F
HF, BF_3 (50%) with organic acids at 347°F
NaCl (25%) at 230°F
Chlorosulfonic acid at 200°F
Br_2, HBr and brominated organics at 140°F
Molten organic acid at 325°F
H_2SO_4 (90%) at 140°F
SO_3 vapor at 212°F
HF (60%) at 240°F
HNO_3 at 350°F
HCl and organics at 275°F

(Further information on Teflon fluorocarbon resins may be obtained from E. I. du Pont de Nemours & Company, Polychemicals Department, Wilmington 98, Delaware.)

Check 5101 opposite last page.

New B&W REFRACTORIES FOR THE CHEMICAL INDUSTRY

B&W's line of refractories has been enlarged by the addition of new heavy duty firebrick and new ramming mixes. These new products, now offered after many years of developmental and field experience, are specifically designed for superior service in gas generators, industrial carbon baking furnaces, silicate of soda tanks and sulphur burners and other typical furnaces commonly used in chemical processing.

FIREBRICK

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HIGH BURNED SUPER DUTY FIREBRICK

Fusion point 3220 F. This brick offers an excellent balance of properties to assure superior service. It provides approximately 5% more alumina content and lower total impurities than competitive brick. It has excellent spalling resistance.

KAO 60

60% ALUMINA FIREBRICK

Fusion point 3250 F. Provides higher hot load strength than any competitive brick. Spalling loss is only 1%.

KAO 70

70% ALUMINA FIREBRICK

Very low total impurities provide long life. Spall loss of only 2%.

RAMMING MIXES

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MULRAM E

Use limit 3200 F. Alumina content—80%. This new ramming mix with extremely low permeability provides exceptional resistance to slag or molten metal penetration. High strength provides good erosion resistance.

MULRAM EF

Use limit 3100 F. Alumina content—80%. Similar to Mulram E but supplied in finer grain.

MULRAM CB

Use limit 3000 F. Alumina content —78%. A new chemically bonded dry ramming mix that provides greater strength at low temperatures, high modulus of rupture and excellent resistance to abrasion, slag and scale.

FOR COMPLETE PROPERTIES SHEETS and additional information on these new B&W Refractories products, write to The Babcock & Wilcox Company, Refractories Division, 161 East 42nd Street, New York 17, N Y.

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R-6979

REFRACTORIES DIVISION

B&W Firebrick, Insulating Firebrick, and Refractory Castables, Plastics, Ramming Mixes, Mortars, and Ceramic Fiber.

Check 5102 opposite last page.

Polypropylene valves withstand solvents and acids

Uses: Processing corrosive products.

Features: Polypropylene valves are light in weight, have high strength and good chemical resistance.

Description: Polypropylene throttlable gate valves are available in sizes ranging from ½ to 2″. Units have good resistance to most solvents, greases, oils and majority of common acids at temperatures up to 185°F. Valves can be furnished with socket-weld, flanged or screwed ends.

(Polypropylene gate valves are product of Vanton Pump & Equipment Corporation, Hillside, New Jersey.)

Check 5103 opposite last page.

Corrosion resistance of polyester resins compared in tests

Wide differences exist in corrosion resistance properties of various polyester resins. Based on results of recent investigations, designers and fabricators of equipment would do well to select a polyester resin according to specific type and not under the general term "polyester".

Tests were made at Atlas Powder. Castings and laminates made from three different polyester resins—bisphenol-A, isophthalic and general purpose — were immersed in eight cororsive aqueous solutions for periods ranging from 24 hours to 90 days. Corrosive media included distilled water, 5% sodium hydroxide, 5% nitric acid, 25% sulfuric acid, 15% hydrochloric acid, 25% acetic acid, Clorox and 5% Electrosol (a commercial dishwashing detergent).

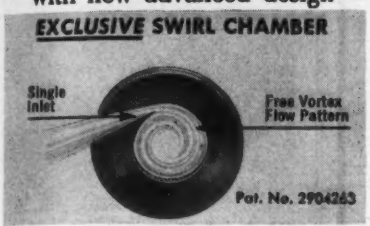
Short Tests Unreliable

Fast screening was found to be a poor yardstick for determining corrosion resistance. Results showed that a resin might stand up under the screening test, but would not after longer immersion periods. For example, isophthalic

DELAVAN'S
SDX
CARBIDE
SPRAY
DRYING
NOZZLE

with new advanced design

EXCLUSIVE SWIRL CHAMBER



The exclusive SDX swirl chamber has a single inlet spiral configuration which produces a natural, free vortex flow pattern. This pattern minimizes friction, adds to the nozzle's long life, and improves its spray characteristics. The special patented chamber is made of hardened stainless steel. The SDX's orifice disc and back plate are made of tungsten carbide, another feature which contributes to the nozzle's long life — a fact which has been proved in laboratory and field tests. The durable SDX is the ideal nozzle for highly abrasive materials.

BETTER ATOMIZATION

The SDX produces a uniform hollow cone spray pattern with exceptionally uniform particle size distribution. It has the added advantage of offering excellent atomization at lower operating pressures.

CERTIFIED PERFORMANCE

The flow rates on Delavan SDX nozzles are certified to be within ±5% of rated capacity, tested on water at 1000 psi. Spray angles are certified to be within ±5° of rated spray angle. This certification is your assurance that Delavan SDX nozzles will perform as rated.

WIDE CHOICE OF CAPACITIES AND SPRAY ANGLES

The SDX nozzle is available in a full range of flow rates, each rate furnished as standard in several spray angles. Matching the flow rate and spray angle in your dryer often means greater efficiency and a better end product.

Write for a copy of Delavan's descriptive Spray Drying Catalog.

DELAVAN
Manufacturing Company
WEST DES MOINES, IOWA
"World's largest manufacturers of nozzles"

Check 5104 opposite last page.

held up fine after a 24 hour boil in sodium hydroxide, but completely deteriorated in 30 days at 210°F.

After 90-day exposure test, none of the bisphenol-A polyester samples were damaged appreciably, with exception of the casting immersed in nitric acid. General-purpose polyester resin was seriouly attacked or completely deteriorated by all of the corrosive media. Isophthalic specimens also suffered serious deterioration, except those immersed in sulfuric acid and Clorox solutions.

Electrosol attacked both the isophthalic and the general-type polyesters after one month of immersion. Bisphenol A polyester retained 50% of its original flexural strength after 90 days.

Sodium hydroxide affected both the general-purpose and the isophthalic polyester. Both lost their flex strength before end of 30-day test period. Bisphenol-A retained about 60% of its flexural strength after three months of exposure at 210°F.

(Further information about polyester resins corrosion tests may be obtained from Plastics Marketing Section, Atlas Powder Company, Wilmington 99, Delaware.)

Check 5105 opposite last page.

Penton ball valves can be taken apart in seconds

Uses: Controlling flow of corrosive liquids at temperatures up to 250°F.

Features: Top-entry design makes it possible to perform on-the-line maintenance instantly. Pipe does not have to be disconnected from valve.

Description: Thermoplastic ball valves are made of either UPVC (for 150°F service) or Penton. Quick, easy access to working parts are achieved by simply unscrewing valve bonnet and lifting out the molded, one piece ball-and stem and Teflon seating inserts.

Design provides full, unimpeded flow with little turbulence or pressure loss. Ball

Gunpowder mixing unit consists of two opposed-type screw agitators housed in a one-inch-thick tally bowl shown here. Top portion of the bowl and agitator troughs are fabricated of Ampco metal plate; bottom ends are sand-cast Ampco metal.

Practically no wear in 1½ years of mixing explosives!

AMPCO®

Mixer is made of strong, tough AMPCO metal to resist abrasion

One of two screw agitators cast of Ampco metal and then machined.

The highly abrasive effect of dynamite wears most metals mirror-smooth in a hurry. Yet, in one powder plant—after 1½ years' service — components of this mixing bowl still show the original grinding marks made during fabrication!

The mixer is all Ampco metal, a high-strength copper-base alloy — even to the weldments. Sand castings and plate of Ampco metal are welded together with Ampco-Trode weldrod of similar physical and chemical characteristics.

Resistance to abrasion — and to erosion and corrosion — is just part of the story. Because Ampco metal is also spark-resistant, the hazards of explosives mixing are minimized.

Call in the field engineer and discuss ways *you* can use Ampco metal profitably. Or write for details. *Ampco Metal, Inc., Dept. 140-G, Milwaukee 46, Wis. West Coast Division: Huntington Park, Calif. — Southwest Division: Garland (Dallas County), Texas.*

AMPCO®

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Check 5106 opposite last page.

CORROSION DATA

20 Selected Results from Service and Laboratory Tests Comparing Ni-Resist with Cast Iron under 400 Different Conditions. Data on comparative service of Ni-Resist in the other corrosive environments may be obtained in the booklet offered below.

Corrosive Medium	Location of Test Specimens	Duration of Test	Temperature °F	Aeration	Velocity	Average Corr. Rates i.p.y. Cast Iron	Ni-Resist**	Type Ni-Resist Preferred
Acetone, 5 parts, and one part Oleic Acid—Linoleic Acid mixture	Separator Tank	131 days	35.6-102 dys. 68.0-150 hrs.	None	None	0.0004	0.00006	1-2
Ammonia, 5-6% by vol.; 150 p.p.m.; Phenol carried by water vapor	Top of phenol tower	309 days	215.6	None	750,000 cu. ft./hr.	0.002	0.0009	1-2
Ammonium, Saturated Sulfate in 3-10% H_2SO_4, plus coke oven gas	Saturator on "Cracker Pipe"	77 days	131	None	Violent	0.08	0.002	1
Calcium Hydroxide (Lime Water)	Laboratory		60	Some	None	0.003	0.0002	1-2
Carbon Dioxide, saturated aqueous solution	Laboratory		60	Some		0.03	0.001	1-2
Coal Tar (High Chloride Content)	Fractionating Column							
	Top	154 days	390	None	Some	>0.2	0.006	3
	Middle	154 days	515	None	Some	0.013	0.001	3
	Bottom	154 days	550	None	Some	0.006	0.003	3
Fertilizer, Commercial "5-10-5" Chemical Fertilizer	In contact with damp granules in storage	290 days	ATM	Some	None	0.010	0.003	1-2
Gasoline (end point containing H_2S & mercaptans plus H_2O. 11-13% chrome steel trays badly corroded)	On top of 24th tray of tower	70 days	370-432	None	Some		0.0027	
Hydrochloric Acid 2%	Laboratory		68			0.88	0.005	1
Paper pulp with small amounts of SO_2, Cl_2, H_2SO_4, pH 4-4.5	Decker effluent	198 days				0.006	0.002	1-2
Petroleum: Crude Oil (reduced, containing 0.584% S)	Bottom of crude tower	290 days	500	None	Turbulent		0.0033	1
Petroleum: Crude Oil (sour, cracked, 0.106% H_2S, & 0.066% mercaptan S)	Top tray or reflux tray of tower	132 days	342-352	None	Gas 26g/m		0.0028	1-2
Sodium Chloride	Salt Brine tank	180 days	50	Considerable	Some	0.010	0.003	1
Sodium Hydroxide 30% plus heavy concentration of suspended salt	Salt tank	82 days	180	Moderate	Moderate	0.0063	0.0001	4
Sodium Phenolate, with 20% (by vol.) tar acids. Total alkalinity of 20% by wt. NaOH	In phenol tower	329 days	248	None		0.002	0.0007	2
Steam condensate with dissolved O and CO_2	In condensate return line	30 days	180	Good	By flow	0.002	0.0004	1-2
Steam	In a nipple expanded pipeline from high pressure steam line	31 days	350	Good	120 lb.	0.002	0.0007	2
Water, brackish, East River, N. Y. C.	Water box of Steam Power Plant	334 days	54	Yes	High	0.010	0.002	1
Water, salt, from oil wells	In salt water pit	217 days	60	Slight	By flow	0.02	0.001	1-2
Water, sea	Intake flume	740 days	ATM	Considerable	5 ft./sec.	0.050	0.002	2

**Consult with Inco for specific corrosion rates for the various types of Ni-Resist.

How Ni-Resist irons "rate" against 20 corrosives

Also possessing excellent mechanical properties, corrosion-resisting Ni-Resist can be specified for a broad range of applications for the toughest service conditions

If you're looking for more satisfactory service life from your fluid handling equipment, you may be surprised by the economies that Ni-Resist* irons have to offer.

That's because Ni-Resist irons — with their Nickel content and austenitic matrix —deliver a unique combination of engineering properties:

They resist corrosion and erosion — they stand up to thermal shock—they have great strength and toughness—they resist metal-to-metal wear.

The unique properties of Ni-Resist irons are cast easily into compressors and blowers, filter drums, kettles and pipe. Ni-Resist irons prolong the life of pump casings, liners, wear rings and impellers. Boost the performance of valves and valve trim components.

In all these applications, Ni-Resist irons deliver the much needed corrosion resistance and mechanical properties. What's more, they *deliver them with cast-metal-economy.*

If the specific media in which you are interested are not given in this list of 20, you can obtain more complete corrosion data by writing us for a copy of "Engineering Properties and Applications of Ni-Resist." A postcard will do it. *Inco Trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

Mechanical and Physical Properties of Ni-Resist	TYPE 1	TYPE 2
Tensile Strength (thousand psi)	25-30	25-30
Thermal Expansion (70-400°F) (millionths per °F)	10.7	10.4
(millionths per °C)	19.3	18.7
Magnetic Response	Non-Magnetic	Non-Magnetic
Modulus of Elasticity (million psi) (at 25% of Tensile Strength)	12-14	15-16.2
Hardness, Brinell: low chromium	130-170	125-170
high chromium	140-190	140-190
Toughness (Izod Impact Test) (foot-pounds) 1.2 arbitration bar unnotched—struck 3" above supports.	100	100
Machinability	Good	Good

NI-RESIST

NICKEL MAKES IRONS PERFORM BETTER LONGER

Check 5107 opposite last page.

Top-entry design of plastic ball valve permits quick, easy access to working parts

operates with minimum friction and assures positive sealing. Ball seating force may be adjusted by nut on valve bonnet. Valves are available in ½" through 3" nominal pipe sizes, threaded or socket type.

(Thermoplastic ball valves are product of Tube Turns Plastics, Inc., Division of Chemetron Corporation, P. O. Box 987, Louisville 11, Ky.)

Check 5108 opposite last page.

NEW LITERATURE
Corrosion Control

The PVC boom is reviewed in 10-page market report. Literature mentions that PVC pipe sales are expected to more than quadruple (using 1957 as a base) by 1966. Report states that in total footage sold yearly, PVC pipe already surpasses stainless steel, brass and aluminum pipe. "The PVC Boom" — A. M. Byers Company.

Check 5109 opposite last page.

Epoxy tar protective coatings are subject of four-page bulletin. Specific corrosion problems that can be handled are listed. Chart cites physical properties and details of components used in the coating systems. Bul 803 — Carboline Company.

Check 5110 opposite last page.

Zirconium data file doubles as handbook. Illustrated with charts, pictures, tables and graphs, literature contains latest technical information and data on zirconium. "Zirconium Data File" — Zirconium Information Center, Carborundum Metals Company.

Check 5111 opposite last page.

Refractories brochure cites descriptions of 15 types of refractories used in chemical and petrochemical plants. Materials such as silicon carbide brick and basic refractories for oxygen steel vessels are also discussed in the four-page document. "Refractories" — Harbison-Walker Refractories Co.

Check 5112 opposite last page.

Steel-bonded carbides are discussed in nine-page technical reprint. Vanadium, tantalum and niobium carbides, bonded with carbon steel are compared. Photomicrographs show grain structure of various cermets. Tables summarize physical properties. "Carbides of Elements of the Fifth Group of the Periodic Table Bonded With Steel" — Sintercast Division of Chromalloy Corporation.

Check 5113 opposite last page.

How use of several metals in cooling water systems can lead to severe corrosion as result of galvanic action is discussed in 10-page Reprint 91—Nalco Chemical Company.

Check 5114 opposite last page.

Silicone and silicone-ceramic coatings are discussed in 20-page bulletin. Products withstand wide ranges of temperatures from low heat up to 1400°F. Tables to simplify coating selection are included. Bul 1570—The Dampney Company.

Check 5115 opposite last page.

Corrosion-resistant polyethylene waste and drainage systems are dealt with in 20-page catalog. Sinks, traps, pipe and fittings, adapters are shown. Considerable space is devoted to polyfusion method of joining the pipe. Vulcathene Catalog—American Vulcathene Division of The Nalge Co., Inc.

Check 5116 opposite last page.

Physical property tables and applications for Teflon rod, tube, tape and sheet are contained in eight-page bulletin. Numerous stock shapes and fabricated parts are shown. Bul BR-4—The Polymer Corporation of Pennsylvania a Subsidiary of The Polymer Corporation.

Check 5117 opposite last page.

Effects of fluid velocity on corrosion is discussed in reprint of technical paper. Galvanic effects, results of cavitation and erosion corrosion of iron, copper alloys and other metals are also reviewed. Photographs and technical tables are included. Reprint "Effects of Velocity on Corrosion" — The International Nickel Company, Inc.

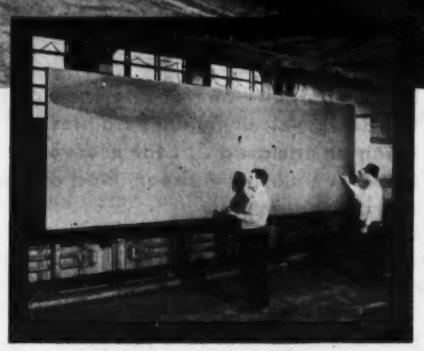
Check 5118 opposite last page.

SHELL CHEMICAL BARGE COMPLETELY FABRICATED WITH LECTROCLAD® PLATES BY DRAVO TO MAINTAIN CONTAMINATION-FREE CONDITIONS

Bart Lectroclad Nickel-Plated Steel Plates were used by DRAVO Corporation to fabricate this contamination-free chemical barge for the Shell Chemical Company.

The prevention of product contamination is extremely important in the processing, storage and transporting of caustics, phenols, glycols, petroleum derivatives and other chemicals.

Bart Lectroclad, since it withstands any forming or fabricating operation that the steel itself will withstand, can be hot or cold formed, sheared, flame cut, bent, die worked, machined, rolled or welded. The big feature which has made Lectroclad one of the most important features in the past ten years, is that it offers an economical and practical protective coating of smooth, ductile, pore-free nickel in its purest form, free of "tramp iron" and inherently bonded to mild steel. Lectroclad process is also used for pipe and fittings where product quality and purity is demanded.



Preliminary visual inspection of 8' x 20' SHD Lectroclad plate

NOW—Bart's extensive research has developed a nickel at a hardness not known before (600 vickers). This new advancement, BART-SHD (super-hard and ductile) Nickel, is extremely well suited for original plating or repair applications requiring erosion-corrosion resistance rolls, shafts, bearings, etc.

BART

Write for TECHNICAL BROCHURE "INDUSTRIAL ELECTROPLATING", PLEASE STATE APPLICATION AND REQUIREMENTS.

BART MANUFACTURING CORPORATION

125 Manchester Place • Newark 4, New Jersey

Pioneers in Electrochemistry, Electroplating, and Electroforming

Check 5119 opposite last page.

TANK

fabricated by

KIRK & BLUM

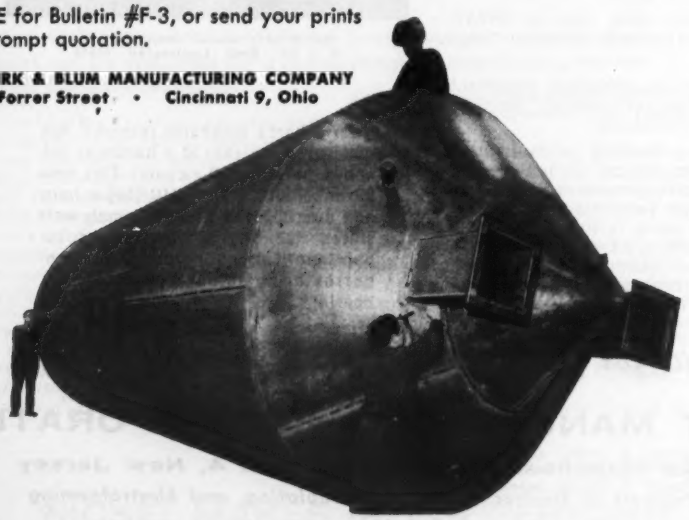
Tanks . . . of every type!

- **Large or small—one or one thousand**
- **Welded steel, aluminum, stainless or other alloys**
- **Open or enclosed . . . for process or storage**
- **Lined or unlined: Rubber, lead or plastic lined for corrosive materials**

For every tank requirement, you can depend on Kirk & Blum's 50 years of experience to fabricate to your specifications . . . and deliver to your schedule.

WRITE for Bulletin #F-3, or send your prints for prompt quotation.

THE KIRK & BLUM MANUFACTURING COMPANY
3133 Forrer Street • Cincinnati 9, Ohio



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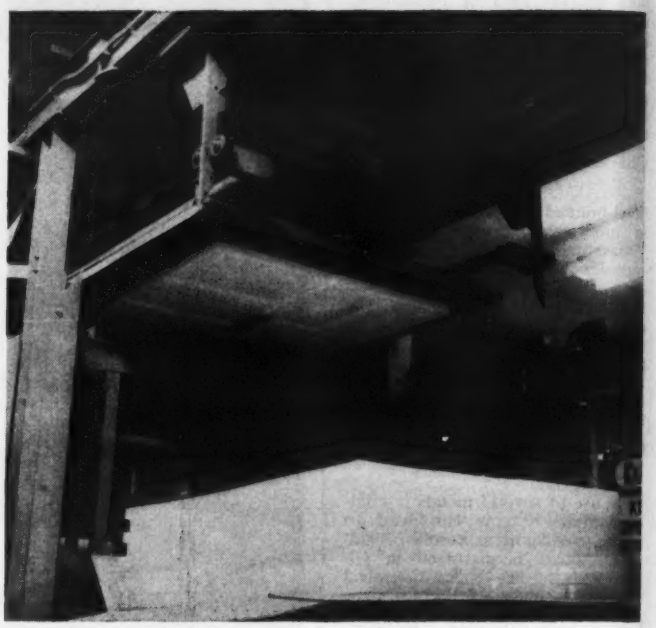


Slab wax is conveyed directly from molding machine to palletizing operation, shown here

Merger of molder, packager and palletizers zooms wax slab output

Three men operate modernized system with 60 tons/shift capacity where formerly 16 men were needed to service eight presses producing 33.6 tons/shift

Wax production capacity up 79%.

Manpower requirements down 81%.

In brief, that sums up what happened when the peculiar aptitudes of a molding machine, a packaging unit and two palletizers were combined by 300′ of belt and roller conveyor in The Atlantic Refining Company's sprawling Point Breeze plant at Philadelphia.

In operation since September 1958, this automated triumvirate eliminates the back-breaking physical effort formerly associated with the task and provides more sanitary operating conditions, a valuable advantage since the food industry takes an important slice of the company's wax output.

Formerly, wax was molded in eight plate-and-frame presses which produced slabs 1½ x 12 x 19″. The slabs were removed by hand and loaded onto pallets or into cartons which were then moved to storage by lift truck.

Each press produced 4.2 tons of product per eight-hr shift, or a total of 33.6 tons. Two men were needed to service each press — a total of 16.

The molding machine which

replaced the eight presses can produce 7.5 tons/hr or 60 tons/shift. All major-scale and refined grades of wax — approximately 20 different kinds — are molded on the machine.

Three men now perform the same functions which formerly required 16.

One man operates the molding equipment and the discharge conveyors from it, controlling speeds, conveyor routes, and watching for difficulties.

A second man operates the carton-packing equipment and the palletisers. He makes the proper settings and sees that the equipment functions properly.

The third man moves the loaded pallets to the warehouse by fork truck.

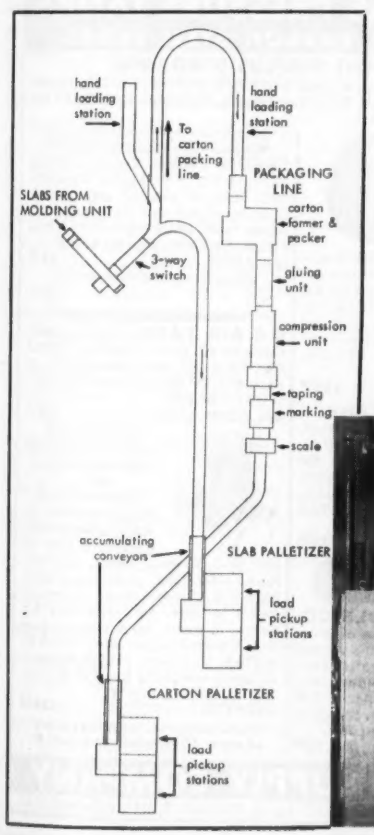
An average of 1500 slabs (measuring 1½ x 19½ x 9⅝") are produced per hr by the molding machine. These slabs drop onto a belt conveyor that feeds two main lines leading ultimately to the palletizers.

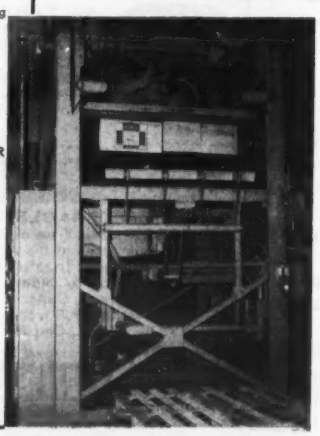
The conveyor carries the slabs to a junction where wax can be shunted to 1) a manual palletizing station where special orders are handled; 2) directly to slab palletizer; or 3) packaging line and from there to carton palletizer.

On the packaging line, slabs are turned, cartoned six slabs to a box, and the box marked and weighed before proceeding to the palletizer.

Both palletizers work in essentially the same way. The product, either slabs or cartons, is assembled a layer at a time on top of the unit, picked up by an overhead vacuum lift and deposited on the skid.

Nine cartons or slabs comprise one layer. Thus one lift picks up 90 lb at a time while the other handles 540 lb. Twenty cartons or slabs are





One of two palletizers used in packaging line (left) at Atlantic Refining, the one shown below handles cartoned wax, 540 lb at a time. Both loaders operate at 20 carton- or slab-per-minute pace. Vacuum lift picks up layer of cartons (or slabs), deposits it on skid

MOBILE GAS STORAGE

WHERE YOU WANT IT FAST WITH

GAS TRANSPORTS

"Mobile" is defined in the dictionary as being "characterized by ease of movement — capable of being readily moved about." This is a perfect explanation of the principal advantage of Taylor-Wharton Gas Transports.

Along with mobility, the transports afford semi-permanent storage of gases in tubes, with capacities up to 100,000 cu. ft. or more depending upon the size and type.

Each modern Taylor-Wharton Gas Transport consists of normalized seamless steel pressure vessels, inspected and tested to I. C. C. 3A-2400 specifications. The vessels are rigidly grouped and mounted on a special trailer chassis with either single or tandem axle. The transport is delivered ready for use, with tubes manifolded to a common outlet in a rear-mounted weatherproof cabinet.

Catalog No. 58 gives complete details on this practical system for flexible gas storage. Write for it today.

More than a Century in Harrisburg 24, Pa

HARRISBURG STEEL CO.

Division of HARSCO CORPORATION

Check 5121 opposite last page.

palletized per minute on the average.

A skid is positioned on either side of each palletizer. The vacuum lift, suspended from a short track, loads one pallet, and then automatically begins on the other.

Ordinarily, wax slabs are built into 23-layer loads. Before this operation begins, a corrugated sheet goes on the skid. When the load is high enough, the edges of this sheet are bent upward along preslotted lines and stapled together to form the bottom half of a shipping container.

After the load is complete, the top half is added and the package tied together with steel strapping.

Cartons are normally assembled into four-layer loads. However, the height of either slabs or cartons can be varied within wide limits by changing the setting on a multiposition switch that is part of the control circuitry of each loader.

(Palletizers are manufactured by The Lamson Corporation, Lamson Rd., Syracuse 1, N.Y.)

Check 5124 opposite last page.

(Pack-O-Matic carton-packing equipment is product of the J. L. Ferguson Co., Troy and Republic Sts., Joliet, Ill.)

Check 5125 opposite last page.

(Molding machine is development of J. W. Greer Co., Wilmington, Mass.)

Check 5126 opposite last page.

Pneumatically-discharging tanker convertible from solid to liquid duty

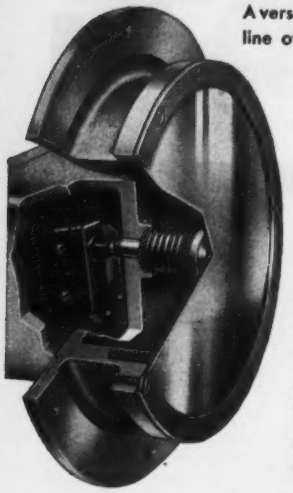
Pneumatically-discharging tank-truck transport can easily be converted from hauler of pulverized solids to seasonal use hauling fuel oil or low-pressure liquids.

Conversion can be accomplished by two men in 6 hr by changing dome covers and removing pneumatic mats along bottom interior.

Shell of transport consists of two conical sections, joined at center of unit, eliminating heavy steel slope-sheets in-

NEW AUTO-BIN-DICATOR*

AUTOMATIC BIN LEVEL INDICATOR



A versatile addition to the Bin-Dicator line of bulk material level controls.

NEW corrosion-resistant construction

NEW stainless steel diaphragm

NEW super-sensitive operation

Explosion-proof and general purpose models listed by Underwriters' Laboratories, Inc.

Prevents overflowing of bins, clogging of conveyors, choking of elevators, damage to machinery; cuts operating costs. Provides simple, reliable, positive control at low cost.

WRITE for Bulletin AB-19 or call VAlley 2-6952

THE BIN-DICATOR CO.
13946-D Kercheval • Detroit 15, Mich.
*TM PATENT PENDING

WE SELL DIRECT • PHONE ORDERS COLLECT

Check 5122 opposite last page.

Detail showing Hackney seamless chime construction.

Stainless steel chemical drums

Hackney returnable stainless steel drums provide safe, economical handling of food and chemical products. Stainless steel resists corrosion, protects contents against discoloration and contamination. Rugged strength takes handling and shipping abuses. Smooth interiors, with seamless chime construction, are always easy to clean.

55-gallon drums available in stainless, Monel, Inconel or nickel. Write for details.

Hackney

Pressed Steel Tank Company
Manufacturer of Hackney Products
1463 South 66th Street, Milwaukee 14, Wisconsin
Branch offices in principal cities

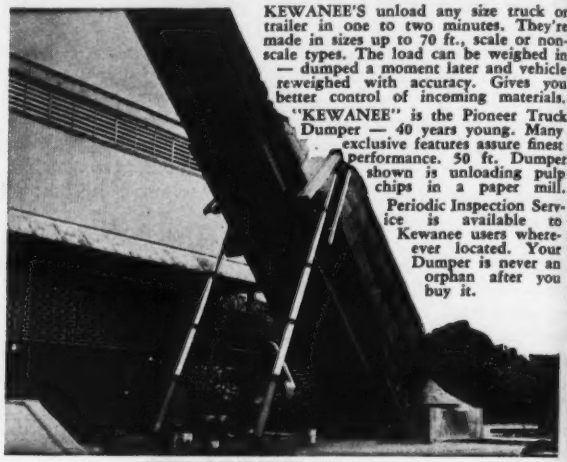
CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

Check 5123 opposite last page.

Kewanee HYDRAULIC TRUCK DUMPERS

WILL ENABLE YOU TO HANDLE INCOMING BULK MORE EFFICIENTLY

Your Production Will Flow with Greater Speed and Smoothness



KEWANEE'S unload any size truck or trailer in one to two minutes. They're made in sizes up to 70 ft., scale or non-scale types. The load can be weighed in — dumped a moment later and vehicle reweighed with accuracy. Gives you better control of incoming materials. "KEWANEE" is the Pioneer Truck Dumper — 40 years young. Many exclusive features assure finest performance. 50 ft. Dumper shown is unloading pulp chips in a paper mill. Periodic Inspection Service is available to Kewanee users wherever located. Your Dumper is never an orphan after you buy it.

Let us engineer a Kewanee into your layout. Write for complete specifications.

SCREW CONVEYOR CORPORATION
699 HOFFMAN STREET
HAMMOND, INDIANA
Southern Plant: WINONA, MISSISSIPPI
West Coast Plant: SANTA CLARA, CALIFORNIA
Branch Offices: Hackensack, N. J. · Dallas, Texas · Memphis, Tenn. · Tampa, Florida

Check 5127 opposite last page.

FLUID & GAS PRESSURE TANKS

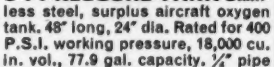
STAINLESS & CARBON STEEL TANKS

(GOVERNMENT SURPLUS BARGAINS)

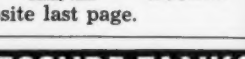
Steel tanks for the handling, storage and transportation of gases, beverages, fuels, hydraulic fluids and other liquids. Stainless steel tanks for corrosive acids and gases.

J-1 PRESSURE TANK Stainless steel, surplus aircraft oxygen tank. 48" long, 24" dia. Rated for 400 P.S.I. working pressure, 18,000 cu. in. vol., 77.9 gal. capacity. ¾" pipe thread fitting at each end. New condition. Shipping weight 247 lbs. F.O.B. Chicago.
No. AE832.....$99.50

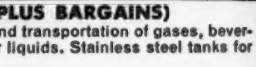
G-1 TANK Stainless steel. Capacity 2100 cu. in. (9 gals.) 450 P.S.I. ¼" pipe thread port at each end. 24" long, 12" dia. Shipping weight 19 lbs. F.O.B. Chicago. (Two for $27.00.)
No. AE63 Each.....$14.95



NON-SHATTERABLE CO_2 CYLINDER This type of pressure bottle was used by the Armed Forces for inflating life rafts. 18¼" long, 3¾" dia. Has ½" pipe thread opening at one end. Capacity 2.98 lbs. of CO_2—at 1800 P.S.I. Shipping weight 10 lbs. F.O.B. Chicago.
No. AE303.....$2.50



FREON TANK Capacity 22 oz. of Freon F22, 6 cc Methyl Alcohol. 18½" long, 2" dia. ¾" pipe thread opening at one end. Equipped with brass valve. Shipping weight 3 lbs. F.O.B. Chicago. (Six for $8.00).
No. AE834 Each.....$1.50



D-2 AIR TANK Carbon steel. Capacity 500 cu. in. (approx. 2 gals.) 450 P.S.I. ¼" pipe thread port at each end. 24" long, 6" dia. Postpaid. (Two for $8.50).
No. AE391 Each.....$4.95

CORNELIUS HIGH PRESSURE (1500-2000 P.S.I.) AIR COMPRESSOR Three cylinder, 3-stage compressor, complete with 27 volt, D.C. 20 amp. motor, with fan. Rated 1500 P.S.I. continuous duty, 2000 P.S.I. intermittent. Pressure switch in base. As released by Air Force, in used, serviceable condition. Covered by our 30 day GUARANTEE. 11½" long, 7" high, 9" wide. Shipping weight 12 lbs. F.O.B. Chicago. Limited quantity.
No. AE549.....$35.00

Write today for FREE CATALOG of other EQUIPMENT BARGAINS!

GROBAN SUPPLY COMPANY
1139 SOUTH WABASH AVE., DEPT. AE-10, CHICAGO 5, ILL., WEbster 9-3793

Check 5128 opposite last page.

corporated in the earlier models. This also reduces gross tank-truck weight by up to 22%.

Delivery Range Up to 250'

Tested at pressures up to 65 psi, tanker—with either unit-mounted or delivery-site blower—is designed for unloading at 25 to 30 psi.

Efficient delivery range can be extended up to 250'. Top discharge speed is attained within 90 sec, loading 100 barrels or more of dry cargo in from 18 to 20 min.

Air is fed from the blower

system into the center base of tanker, inflating two pneumatic mats. When properly billowed, these perform same function as earlier model's steel slope-sheets. Higher pressure air then flows up through tanker's contents from a between-the-pads fabric diffuser mat, aerating contents before entering small discharge vent at top of tanker. It then flows down through an outer ring to the air discharge pipe at bottom.

As air velocity increases, the stream picks up tanker contents settling into discharge valve and pumps them into storage facilities.

(Delta-Matic transports are development of Materials Handling Equipment Division, Delta Tank Manufacturing Co., Inc., Subsidiary of General Gas Corp., Baton Rouge, La.)

Check 5129 opposite last page.

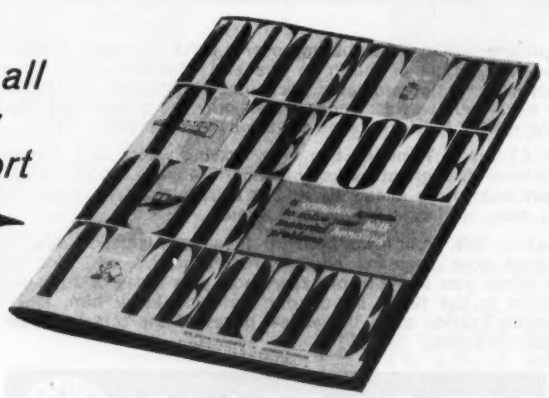
NEXT MONTH

By replacing a manual weighing and filling system with an automatic bagger, packaging potential was nearly quadrupled at Spencer Chemical Company's Jayhawk Works, Military, Kas. For details, see this section next month.

in bulk handling TOTE SYSTEM* has the answers

. . . and they're all here in this new 32 page report

Write for it TODAY



TOTE SYSTEM, INCORPORATED

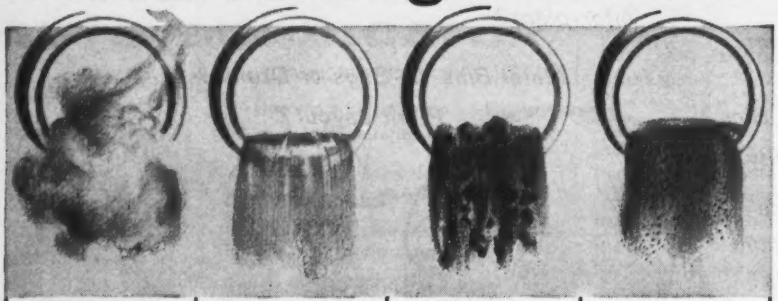
680 So. 7th, Beatrice, Nebraska

Subsidiary of Hoover Ball and Bearing Co., Ann Arbor, Mich.

*TOTE AND TOTE SYSTEM REG. U.S. PAT. OFF.

Check 5130 opposite last page.

Waste Handling...*Presolved!*



Gases and Vapors	Clear Liquids	Slurries	Solids and Semi-solids
Waste and toxic gases • vapor recovery and recondensation • vacuum distillation • gas blowing • refrigerants • low vacuum	Surface drainage • tank car unloading • process wastes • viscous liquids • acids: sulphuric, hydrochloric, acetic • spent caustic brine • cyanides • tank farm drainage	Liquids with ashes, fly ash, cinders, coal particles, catalysts, coke, sand, glass • tar • paint • pigments • adhesives • abrasives • molten sulphur • cane juice • black liquor	Heavy, bulky, dry materials • acid slurries • sand • ashes • powdered coal • cracking catalysts • sludges • pulp
Air Cooled Units	Submersible Pumps	Series 8000	Transporter
Fan Cooled Units	Series 3000	Series 6000	Expelsor®
Water Cooled Units	Unique Designs	Shone® Ejectors	Package Shone®
		Pneu-Pumps	

Right now you may be puzzling over a particular waste handling job—which type of pump to use and whether pneumatic or electric; corrosion problems; reclaimable materials; precautions for hazardous wastes; and a dozen other considerations. Handling wastes is tricky, takes a know-how all its own.

For 61 years, Yeomans has been solving waste and drainage problems throughout industry. Once in a while, Yeomans engineers bump into a new twist, but usually the job is one that has been worked out time and again.

Chances are, your own problem is already solved. Why not contact your Yeomans engineer-representative and find out. He brings you a wealth of experience, plus types of equipment unique in the field. If you don't already know him, look in Sweet's Catalog or in the yellow pages of the telephone book under "Pumps."

YEOMANS

Pumps and Waste Treatment Equipment

P-5924

2003-5 N. Ruby St., Melrose Park, Illinois

Check 5131 opposite last page.

MATERIAL HANDLING and PACKAGING

Operator opens discharge door of bin containing 4800 lb of BaO — part of five-minute bin interchange operation. Preset scale and push-button actuator take care of dumping chore

P_2S_5 and BaO in bulk bins . . .

Pares handling and material costs, averts safety hazards

Problem: Handling of phosphorous pentasulphide and barium oxide in drums at a major midwestern refinery was a time-consuming operation, involving premium warehouse space, and posing safety hazards.

Hygroscopic P_2S_5 was shipped to the refinery aboard enclosed trucks, 200 cardboard drums to a load. This type of container was used because it would not be corroded by the powder and it could be discarded.

Deadly hydrogen sulfide is generated by P_2S_5 when exposed to moisture, so each truck was checked with a meter upon arrival. If gas was detected, unloading was deferred until it had dissipated — a 2- to 48-hr wait. Even then workmen often were required to wear masks while unloading drums.

BaO arrived at the refinery on flatbed rail cars (250 metal drums to a car) from a shipping point 2000 miles distant.

The latter was stored outside, but the P_2S_5 was warehoused inside, occupying 3000 sq ft of prime space.

In addition one man was required full time to handle and feed contents of drums

into the slurry pit. He had to wear goggles and respirator mask.

Cardboard drums were discarded, while metal drums were either discarded or sold at fractional prices which did not even recover cost of salvage operations.

Solution: After trial run in 1957, the company converted almost completely to bulk handling of both powders.

Three tilting bin-discharge mechanisms were purchased and 144 metal bins leased. These provide three-way service — as shipping containers, storage bins, and discharge hoppers.

Two sizes of containers are used: 72 are 74-cu-ft aluminum bins, each holding 5000 lb of P_2S_5. The remainder are 42-cu-ft carbon steel containers, each holding 4800 lb of denser BaO.

Discharge mechanisms are

Comparison of containerization with previous system

	Before	After
P_2S_5		
Amount unloaded	30,000 lb (200 drums)	30,000 to 35,000 lb (6-7 bins)
Manpower	2 men, lift truck	One man, truck
Time used	8 man-hr	0.75 man-hr
Labor savings	—	12c/100 lb
Bulk discount	—	$1 to $1.05/100 lb
Total savings/load . . .		$409.50 to $468
BaO		
Amount unloaded	100,000 lb	124,800 lb
Manpower	5 men, lift truck	one man, truck
Time used	20-30 man-hr	8 man-hr
Labor savings	—	3c/100 lb
Bulk discount	—	50c/100 lb
Total savings/load . . .		$661.44
Feeding P_2S_5 and BaO to slurry	man, full time	5 min/bin

You can find a bigger price... but not a better coupling

LINK-BELT MOTOR COUPLINGS are priced low among high-quality flexible couplings

Here's your best value in the flexible coupling field . . . an ideal, low-cost answer for such motor-driven equipment as pumps, compressors, speed reducers and generators.

Besides substantial first savings, you realize the economies of fast, easy assembly and servicing. Allen head, spiral cam fasteners, which open and close with only a quarter turn, are a permanent part of the cover . . . no loose nuts or bolts.

There's economy in performance too. Geared design assures high capacity and durability . . . torque transmitting parts are accurately machined from cold-rolled steel. Especially important, compensation for both angular and parallel misalignment is FREE—i.e., without imposing loads on shafts and bearings.

Link-Belt Motor Couplings are immediately available off-the-shelf for shafts up to 2½".

FOLDER 2875 has complete information. For your copy, write your nearest Link-Belt office or authorized stock-carrying distributor.

NEW!

CORROSIVE-DUTY COVER

This new cover provides positive protection for Link-Belt Motor Couplings against damaging effects of corrosive attack. Construction includes stainless steel fasteners, polyester fiber seals.

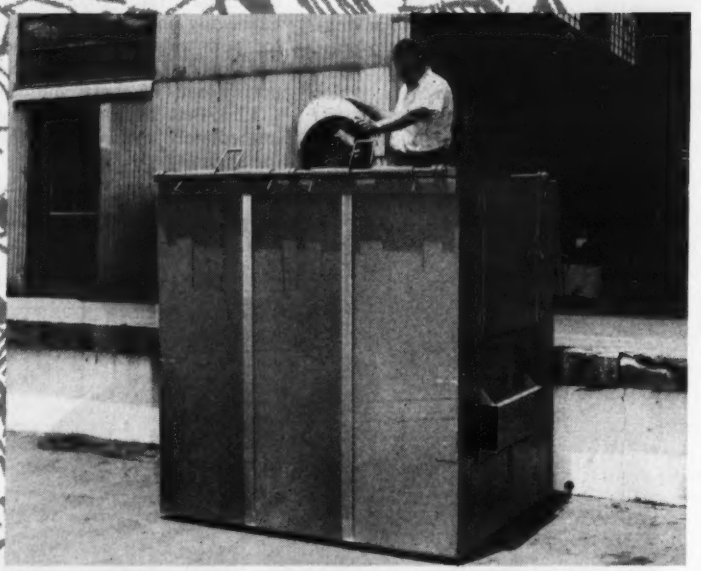
LINK-BELT

GEARED FLEXIBLE COUPLINGS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,153

Check 5132 opposite last page.

NOW! You Can End Refuse Storage Problems...WITHOUT Capital Outlay



DUMPMASTER-Equipped Private Haulers Provide Containers and Efficient Service

If you're plagued with trash piles, scattered refuse, fire hazards, and hit-or-miss collection, there's a good chance you can do something about it . . . WITHOUT CAPITAL OUTLAY!

In most major cities DEMPSTER-DUMPMASTER-equipped private haulers will put clean, big-capacity storage containers at convenient locations in your plant . . . empty them mechanically on schedule, or on a call-in basis . . . all for a reasonable monthly fee.

When you containerize your refuse, plant housekeeping becomes easy, employee morale goes up.

Write today for the name of your nearest private hauler. We'll also send literature describing his service.

IN ALL LEADING CITIES FROM COAST TO COAST

DEMPSTER DUMPMASTER® Equipped Private Haulers

Write Today for
Free Brochure and Name of Nearest Private Hauler
DEMPSTER BROTHERS
Inc.
Dept. CP-10 KNOXVILLE 17, TENNESSEE

Check 5133 opposite last page.

mounted on scales which can be preset to cut off flow of powder when desired quantity has been dumped. Bins are positioned by fork lift on discharge mechanisms which then tilt the containers at a 45° angle.

Changing bins, setting scale and actuating tilt is a five-minute operation.

Two of the discharge units are activated by air pistons, while the third is controlled by chain hoist, due to space limitations.

Results: Changeover to bulk handling has minimized hazardous handling conditions since bins have airtight seal; released 3000 sq ft of warehouse space because they are stored outdoors; freed one man for other duties; and provided a bonus of savings in shipping and handling costs (see box).

P_2S_5 now arrives at refinery on a flatbed truck — six to seven bins to a load, while barium oxide is shipped on railroad flatcars, 26 bins to a load. Empties are deadheaded back to suppliers by trucker and railroad.

One man with fork truck can unload truckload of bins, store them, and load truck with empties in 45 minutes. Similar combination takes care of carload of bins in course of shift.

Fork-truck operator who delivers bin to discharge station also performs feeding opertation, freeing one man for other duties.

(Tote System of bulk handling, including Tote Bins and Tote Tilts, was engineered, fabricated and installed by Tote System, Inc., Beatrice, Nebraska.)

Check 5134 opposite last page.

Mixed materials sorted and moved by feeder

Mixed loads of solid materials or solids and liquids can be separated and moved to collection points with vibrating screen feeder.

A pneumatic vibrating drive located under the feeder vibrates both the lower and upper tray which is a porous

steel screen. This sifts fine material from the coarse in upper tray. Same action moves both materials along the tray into individual bins.

Feeders and conveyors can be either floor mounted or suspended. Springs are used only to supply flotation, not to amplify vibration.

(Vibrating screen feeders and conveyors are manufactured by The Cleveland Vibrator Company, 2828 Clinton Ave., Cleveland 13, Ohio.)

Check 5135 opposite last page.

Palletizer is 'Go-between' for fork truck, conveyor

More than 1000 bags/hr can be palletized by one man using powered turntable station as go-between for flexible loader and swivel stacker and a fork lift truck.

Bags are power propelled into position on the pallet with the operator guiding each bag, using any palletizing

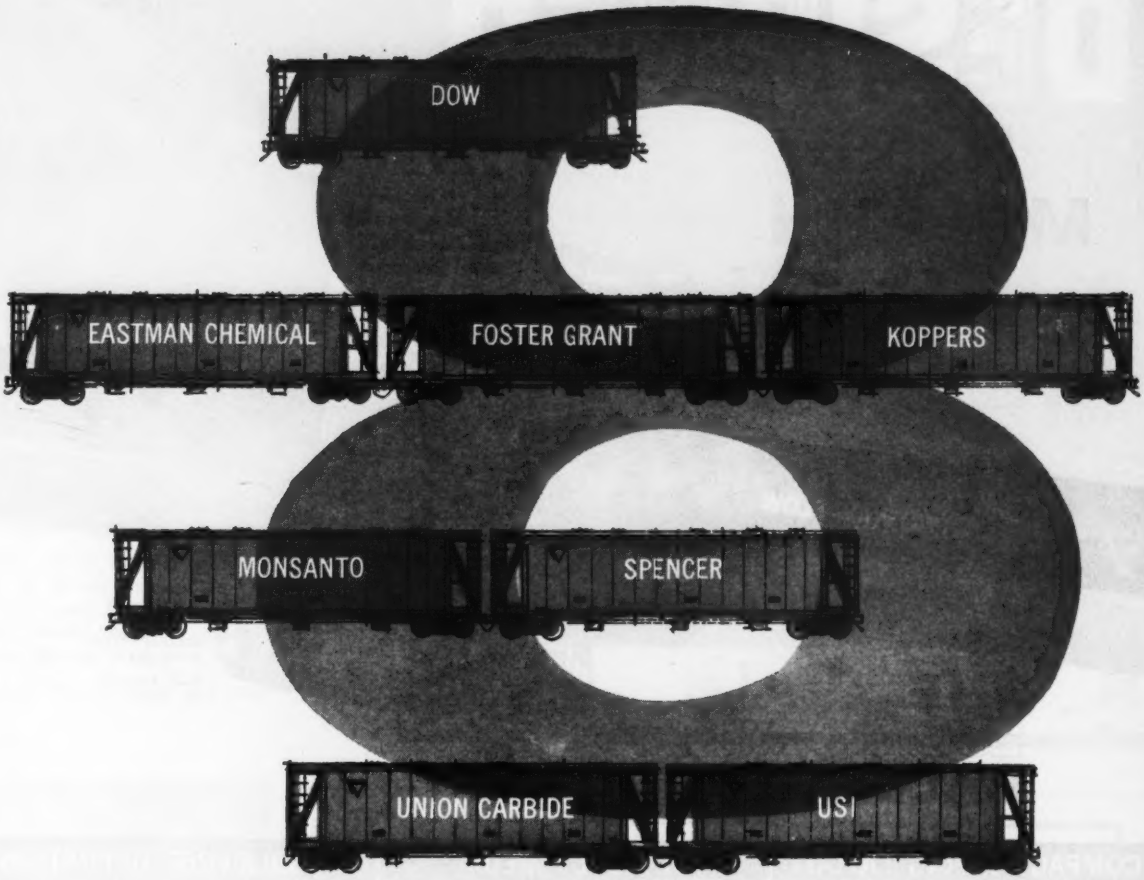
Palletizer in use

pattern. When pallet is loaded, turntable is power-rotated to position a new pallet while the loaded pallet is removed by fork lift. Bags can be glued automatically to prevent shifting on pallet.

(Palletizer system is described in Bul 30 available from Power-Curve Conveyor Company, 2185 S. Jason St., Denver 23, Colo.)

Check 5136 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.



8 major chemical companies are now using the **DRY-FLO® CAR** for bulk shipment of **POLYETHYLENE** and **POLYSTYRENE**

Ask the nearest General American office about the advantages of bulk shipment for your product.

DRY-FLO GENERAL AMERICAN TRADE MARK

Airslide® and Dry-Flo® Car Division
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 3, Ill. • Offices in principal cities

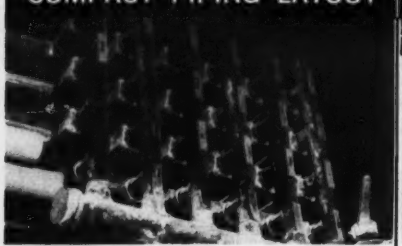
The Dry-Flo® car provides maximum sanitation and full protection for materials that require careful handling.

Check 5137 opposite last page.

ILLUSTRATED:
1" SIZE
SIZE RANGE:
¼" TO 6"

THE ECON-O-MISER BALL VALVE

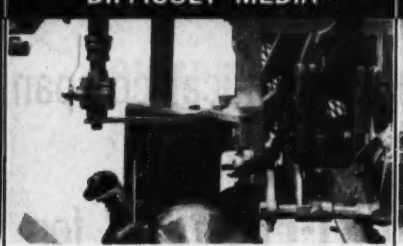
COMPACT PIPING LAYOUT



Here are 19 Econ-O-Miser Ball Valves compactly installed on this paint blending manifold. Note the absence of unions . . . this valve is both a valve and a union! The Econ-O-Miser is smaller, easier to install . . . just right for modern piping layouts, where equipment must fit into tight areas.

Let us show you . . . in your own plant! Write us about your limited space problems!

DIFFICULT MEDIA



The Econ-O-Miser Ball Valve successfully controls the flow of cold glue with a viscosity of molasses, on the WORLD Tandem Labeler manufactured by Economic Machinery Co. Clean wiping action, positive leakproof shut-off, and smooth round flow, make the Econ-O-Miser ideal for handling difficult media.

Let us show you . . . in your own plant! Write us about your media problems!

TROUBLE-FREE OPERATION

Outdoor propane and butane storage tanks in remote field processing plants require dependable positive shut-off valves on bleed lines. The unique features of the Econ-O-Miser Ball Valve provided the practical answer . . . no lubrication . . . no metal-to-metal contact . . . quick visual ON-OFF indication . . . trouble-free service.

Let us show you . . . on your outdoor applications! Write us about your valve maintenance problems!

COMPARE . . . THE ECON-O-MISER BALL VALVE

NO UNION NECESSARY

WORCESTER VALVE CO., INC.

16 PARKER STREET, WORCESTER, MASS.

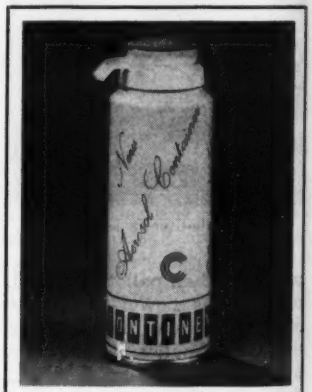
Check 5138 opposite last page.

Automatic lip-actuating

. . . is feature of adjustable lip dockboard. Multiple exposure photo shows unit first in normal dock level position with lip protected behind steel-faced rubber-backed bumpers. Upon release, precision counterbalance raises dockboard until lip will swing over truck bed. At this point lip automatically extends to working position and locks. Adjustment is completed by stepping on the dockboard and automatically locking it. Lip retracts automatically when truck pulls out.

(Adjust-A-Lip dockboard is manufactured by The Kelley Company, 2151D W. Mill Rd., Milwaukee 9, Wis.)

Check 5139 opposite last page.



Aluminum pressure can

. . . combines lightness and strength with small diameter for easy handling and excellent resistance to rusting.

Two-piece extruded container, readily receptive to multicolor, wrap-around lithography, is available in four-ounce size and has standard one-inch opening for basic valve designs.

(Aluminum Pressure Can is development of Continental Can Company, 100 E. 42nd St., New York 17, N.Y.)

Check 5140 opposite last pg.

LATEST INDUSTRIAL TRUCK DEVELOPMENTS

. . . in design, capacity, operating features, and accessories for improved performance and safety

Outdoor duty

. . . over rough terrain is the primary purpose for lift trucks being introduced by automobile manufacturer, but they are compact and low enough to be used indoors.

Equipped with either gasoline or diesel engine of 172 cu in displacement, truck is offered with four stacking heights—10, 12, 16 and 21′ and two- and three-stage masts. Loads of 4000 lb can be handled by 10 and 12′ lift trucks.

Features include 8′ height, power steering, and masts which can be tilted hydraulically 6½° forward and 13¼° backwards. Load can be shifted 6″ from side to side by lateral movement of fork.

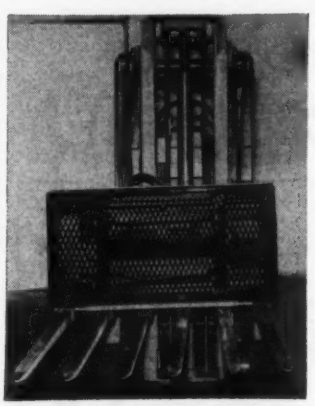
(Series 4000 heavy duty fork lift is being introduced by Tractor and Implement Division, Ford Motor Company, Birmingham, Mich.)

Check 5141 opposite last page.

Push-off device

. . . with side shifter and multiple forks for electric trucks has been developed for establishments using a take-it or leave-it pallet system. In this system, unit loads are handled in process and placed in storage on pallets but shipped without pallets. During process and in storage, palletized loads are handled conventionally. When loading carriers, multiple tined forks are slid between small stringers on top of pallet and load raised off. Load is then moved to carrier and pushed off forks.

(Push-Off Device with side shifter and multiple forks is



development of Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass.)

Check 5142 opposite last page.

Low maintenance

. . . is feature of mechanically-actuated carbon pile speed control for electric trucks. Control affords infinite speed control and gives both high starting torque and smooth operation by eleminating time delays between speed changes.

Simplicity of design operation assures long life with virtually no maintenance.

(Carbon pile speed control, available on K-58 electric trucks series, is development of Yale Materials Handling Division, The Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.)

Check 5143 opposite last page.

modernize with

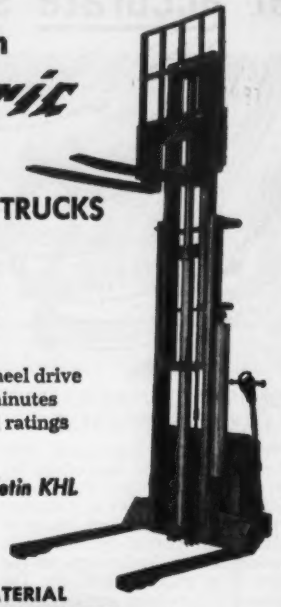
HydroLectric

A GREAT NAME IN LIFT TRUCKS

- Two driving wheels instead of one
- Braking with handle in any position
- Automatic parking brake (optional)
- Sealed alloy gears instead of chains
- Sealed ball-bearing rollers in masts
- 100% more steering ease with two wheel drive
- Power unit removal complete in 20 minutes
- Greater tire capacity equivalent load ratings

LIFT TRUCKS INC. W.W.W. STUEBING CINCINNATI

• *Write for Bulletin KHL*



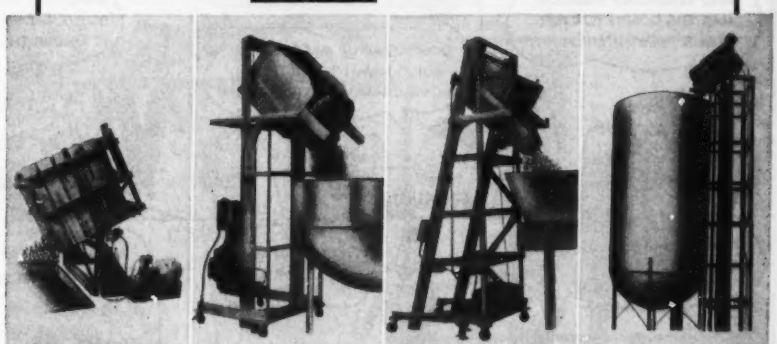
A TRUCK FOR EVERY PURPOSE AND MATERIAL

LIFT TRUCKS, INC.

CINCINNATI 14, OHIO

Check 5144 opposite last page.

NOW YOU CAN LIFT and DUMP ANY CONTAINER



HYDRO-DUMPER Dumps up to 4 feet. Load capacity, 6000 pounds.

JUNIOR DUMPER Dumps up to 8 feet. Load capacity, 700 pounds.

SENIOR DUMPER Dumps up to 20 feet. Load capacity, 4000 pounds.

VERTICAL DUMPER Dumps to any practical height. Load capacity, 4000 pounds.

Yes, no matter what size, shape or type container you use to receive, store or process free-flowing material — or whether it's a special in-plant container — ESSEX can supply the necessary dumper.

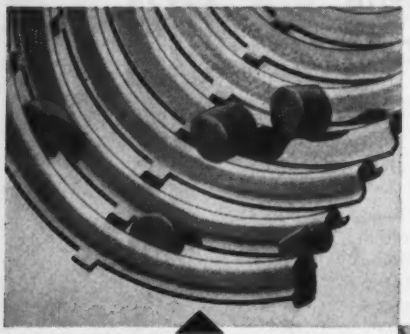
ESSEX dumpers are flexible in design so they can be modified to suit your job conditions. For the safe, reliable, economical way to lift and dump material in any container, call upon ESSEX for the answer.

ESSEX CONVEYORS, INC.

Dept. CP, 101 Colden Street, Newark 3, N. J.

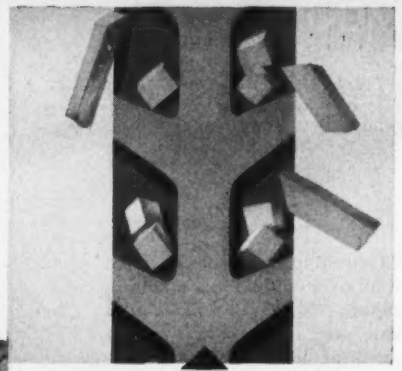
Check 4934 opposite last page.

get accurate sizing with SIMON-CARTER machines



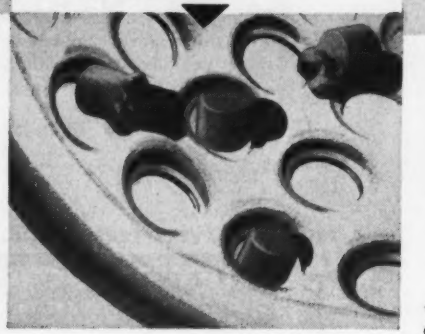
CARTER GRADERS ALSO SIZE AND SEPARATE BY WIDTH

For *width* sizing and separating, the Precision Graders use revolving cylinders with round perforations. Material placed in these cylinders is upended and presented to the round perforations in an endwise position. Narrow pieces pass through, and wider pieces pass over for discharge at the end of the cylinder.



PRECISION GRADERS SEPARATE MATERIAL BY THICKNESS

For sizing and separating free-flowing granular materials by *thickness*, Carter Precision Graders use revolving cylinders with slotted perforations. Material placed in these cylinders is upedged and presented to the slots in an edgewise position. The thinner pieces pass through, and the thicker pieces pass over and are conveyed to the end of the machine.



CARTER SEPARATORS ASSURE POSITIVE LENGTH SEPARATION

Carter Disc Separators contain a series of discs, each of which has hundreds of undercut pockets which select or reject materials according to *length*. As the discs revolve through a mixture of materials, the pockets lift out shorter pieces. Longer pieces, too long to be held in the pockets as they rise, drop away from the discs.

Write today for complete information and descriptive booklets on Simon-Carter machines. Free laboratory testing and demonstrating service.

SIMON-CARTER CO. 677 19TH AVENUE N.E. MINNEAPOLIS 18, MINNESOTA

Check 5145 opposite last page.

"WHO SAID A NEW PLANT LAYOUT?

I JUST NEED A NEW CONVEYOR!"

AND CLEVELAND VIBRATOR HAS THE CONVEYOR FOR YOUR PRESENT LAYOUT!
DON'T TEAR UP MACHINES OR BUILD NEW FOUNDATIONS. MOVE GRANULARS OVER THEM!
HERE'S AN EASY WAY TO SOLVE THE PROBLEM. PUT IT UNDER THE FLOOR...
... OR THROUGH THE FLOOR. CLEVELAND CONVEYORS NEED NO SPECIAL FOUNDATIONS!
AND CLEVELAND'S LIGHTWEIGHT CONVEYORS CAN BE EITHER HUNG...
...OR SPRUNG ...OR EVEN
A COMBINATION OF BOTH!
THERE'S A CLEVELAND CONVEYOR JUST RIGHT FOR MY PRESENT LAYOUT!
JUST RIGHT FOR YOUR PRESENT LAYOUT, TOO!
CLEVELAND

IF YOU HAVE Bin Stuck Lately? CALL CHerry 1-7157 FOR A FEEDER OR CONVEYOR for every installation ...every need

THE CLEVELAND VIBRATOR CO.

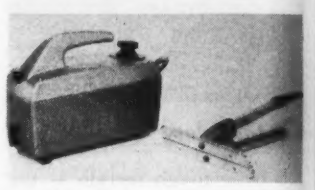
10C-2706 Clinton Ave., Cleveland 13, Ohio

Check 5146 opposite last page.

Two-piece portable sealer tackles big jobs

Uses: Sealing of large drums, liners and bags, enclosing bulky items in polyethylene, and fabricating large items of polyethylene sheets.

Features: Sealer is lightweight, tongs weighing 1.76 lb. Tongs are connected to power pack by 6½'-long cable.

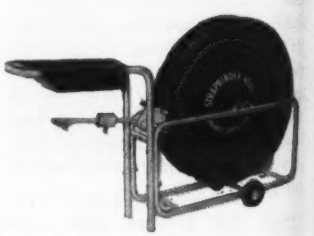


Description: Power pack is used to give strong current impulse to heating tape on the sealing tongs. This quickly heats plastic up to its melting point. Rapid cooling is attained by conduction of heat into body of sealing instrument.

Unit gives seal 8" long by ⅛" wide. Unit can seal two pieces of .006 polyethylene or two pieces of .0035 PVC.

(Model 8T portable thermal sealer is product of Weldotron Corporation, 841 Frelinghuysen Ave., Newark 12, N.J.)

Check 5147 opposite last page.



Coil lifting eliminated

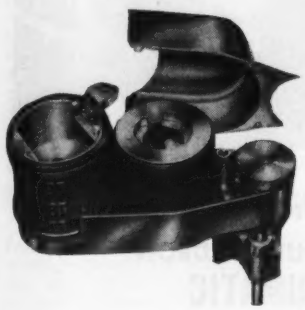
. . . with mobile steel strap dispenser which handles ⅜, ½, ⅝ and ¾" vibrated wound flat strapping in all sizes of oval steel strapping. Consisting of tubular steel frame and reel mounted on two wheels, dispenser is 10 ½" wide.

Loading is accomplished by tipping it on end and unlocking reel which is placed flat on floor. A lock nut is removed

and one side of reel taken off. Strapping is placed on reel, side replaced and locked. Loaded reel is then rolled into dispenser.

(Model 416 mobile strap dispenser is product of A. J. Gerrard & Company, 400 E. Touhy Ave., Des Plaines, Ill.)

Check 5148 opposite last page.



Three-color coding

. . . is now possible with coder using solid ink. Machine prints a legend 3" high and up to 15" long, using as its ink supply three one-in rollers fabricated from micro-porous, micro-reticulated plastic. Each cylinder holds enough ink in suspension for the printing up to 150,000 legends. Cylinders are available in violet, red or black, with other colors available on special order.

(Model 603 Teko Coder is being introduced by The Thomas Engineering Company, 9257 N. Laramie Ave., Skokie, Ill.)

Check 5149 opposite last page.

A NEW HIGH...IN VALUE
A NEW LOOK...IN STYLING
A NEW LOW ...IN PRICE

AUTOMATIC'S Gas Operated LIFT TRUCKS

VALUE PLUS—Automatic's simplified power package offers the ultimate in high operating efficiency, low cost of operation, and maximum safety. A gas engine and variable voltage generator, precisely matched, supply exact power to the electric drive motor...no clutch or hydraulic torque converter to cause trouble or worries. Here are a few of Automatic's plus value features:

- Operates on 25 to 30% less fuel
- 50% longer hydraulic pump life
- Oversize brakes last up to 30% longer and are adjustable without removing wheels
- Longer-life, advanced-design roller mounted uprights
- Ventilated exhaust dispels fumes
- New 3-way adjustable seat increases driver efficiency—reduces fatigue

MODERN STYLING—New orange and blue color combination. Automatic's new special high visibility safety orange adds another safety plus feature to your plant, while its new royal blue color accentuates the truck's low center of gravity and high stability.

THE PRICE IS RIGHT—No longer a premium-priced truck, but priced competitively with trucks which use hydraulic torque converters.

CAPACITIES: ▲
3,000 to 10,000 lbs. with cushion tires.

CAPACITIES: ▶
3,000 to 8,000 lbs. with pneumatic tires.

AUTOMATIC®

AUTOMATIC TRANSPORTATION COMPANY
Division of The Yale & Towne Manufacturing Company
41 West 87th Street, Dept. TO, Chicago 20, Ill.

FIRST IN IMAGINATION
FIRST WITH REALITY

LEARN MORE ABOUT AUTOMATIC'S COST-CUTTING LIFT TRUCKS

Please send me complete details about Automatic Gas-Operated, Electric-Driven Lift Trucks, in capacities of_____lbs._____lbs._____lbs.

NAME_____
FIRM_____
ADDRESS_____
CITY & ZONE_____ STATE_____

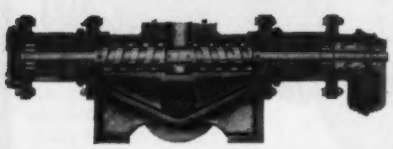
Check 5150 opposite last page.

46 *Sier-Bath* ROTARY PUMPS

help keep fluids moving at AMERICAN CYANAMID'S New Santa Rosa Plant

● Now in operation at Escambia Bay, Florida, this modern plant has a design capacity of 27 million pounds of Creslan acrylic fiber annually. The plant represents an advanced, straight-line approach to acrylic fiber production. To assure dependable, high-capacity pumping of raw and in-process materials, a total of 46 Sier-Bath external gear and bearing type Screw and Gearex Rotary Pumps are in operation.

Sier-Bath SCREW PUMPS



External Gear and Bearing Bracket Type for non-lubricating liquids and semi-liquids

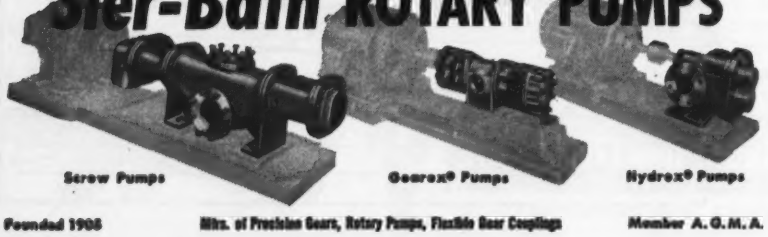
Internal Gear and Bearing Type for lubricating liquids and semi-liquids

Sier-Bath Screw Pumps maintain high volumetric efficiency because "Dual-Controlled" precision rotor design prevents rotor-to-rotor or rotor-to-casing contact—provides a continuous flow without pulsation, hammering or vibration . . . without strains, misalignment and wear on rotors, shafts, bearings and gears.

Result: Dependable, uninterrupted pumping service—less maintenance—easier servicing—longer pump life—lower overall pumping costs.

Capacities from 1 to 2,000 gpm.; viscosities from 32 SSU to 1,000,000 SSU.; discharge to 1,000 psi. for viscous liquids, 200 psi. for water and light oils. Horizontal or vertical construction. Corrosion resistant alloys, special bodies, stuffing boxes and bearings for special needs. See "Yellow Pages" for your Sier-Bath representative or write Sier-Bath Gear & Pump Co., Inc., 9260 Hudson Blvd., North Bergen, N. J.

Sier-Bath ROTARY PUMPS



Screw Pumps | Gearex® Pumps | Hydrex® Pumps

Founded 1908 | Mfrs. of Precision Gears, Rotary Pumps, Flexible Gear Couplings | Member A. G. M. A.

Check 5151 opposite last page.

HANDLING & PACKAGING

Storage problems solved with clamps and pipe

Clamps and ordinary pipe may be used to create storage racks for hard-to-store items as well as for balconies and ordinary type racks for normal pallet storage requirements. If storage requirements change, racks can be quickly reassembled to meet other needs.

(Tube-Strut universal clamps are manufactured by Tube-Strut Corp., 2960 Marsh St., Los Angeles 39, Calif.)

Check 5152 opposite last page.

NEW LITERATURE
Material Handling and Packaging

Safe transit tests and their application to corrugated shipping containers are described in Safe Transit Tests Bul—Gaylord Container Corporation, division of Crown Zellerbach Corporation.

Check 5153 opposite last page.

Hoists, trolleys and cranes, both motor-operated and hand-operated, are cataloged in eight-page Bul DH-28A—Wright Hoist Division, American Chain & Cable Co., Inc.

Check 5154 opposite last page.

Plastic bagmaker that starts with resin granules and delivers finished printed plastic bags ready for use in variety of sizes, thicknesses and colors, with or without vent holes, is described in Bul 270—F. J. Stokes Corporation.

Check 5155 opposite last page.

Automatic weighing systems and components are described with text, illustrations and informative diagrams in 16-page Cat 200—Dynametrics Corporation.

Check 5156 opposite last page.

Advantages of live storage are explained with photographs, drawings and diagrams in eight-page Flow Rack Bul—The Rapids-Standard Company, Inc.

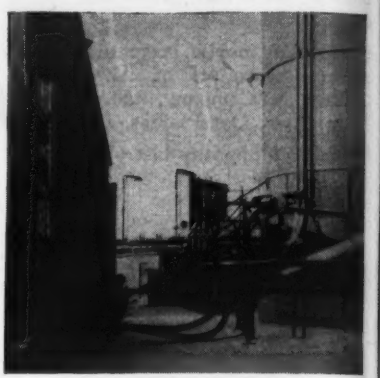
Check 5157 opposite last page.

Benefits accruing from centralization of cement-loading facilities at one plant is the story told in Bul ER-3241-4—Fuller Company.

Check 5158 opposite last page.

Problem:

To cut costs and gain floor space in flour handling operations



Solution:

SPROUT-WALDRON
PNEUMATIC SYSTEM

In addition to the standard savings of 12¢ per bag which automatically applies when you shift from bag to bulk flour, Chef Boy-Ar-Dee, Milton, Penn., gained these advantages with the Sprout-Waldron pneumatic system:

1. Faster handling
2. Lower operating costs
3. Simplified maintenance
4. 10,000 square feet of floor area
5. Improved housekeeping

The system picks up from rail cars and delivers the flour to storage at rates of 20 tons per hour. It then transfers it 600-700 ft. to plant bins at rates of 6000 pounds per hour. Heat exchangers incorporated in the system keep the flour at proper blending temperature at all times.

For the full story of savings at Chef Boy-Ar-Dee request Bulletin 1-54.

CW/108

SW SPROUT-WALDRON
Muncy, Pennsylvania

Size Reduction • Size Classification • Mixing
Bulk Materials Handling • Pelleting

Check 5159 opposite last page.

Tablet packager which combines vertical feed with horizontal sealing head and is suitable for packaging dusty, fragile products such as corrosive chemical tablets, is detailed in Tablet Packager Specs —Wrap-Ade Machine Co., Inc.

Check 5160 opposite last page.

Strapping tools, including four electric-powered tools and eight air-powered models, are in Power Strapping Tools Bul—Signode Steel Strapping Company.

Check 5161 opposite last page.

Electronic weighing attachments, which make possible in-transit weighing of loads by fork trucks and eliminate need for weighing loads at platform scales, are introduced in Cat SS-1665—Industrial Truck Division, Clark Equipment Company.

Check 5162 opposite last page.

Tank cars, hopper cars and tank storage terminals are among products and services illustrated and discussed in General Cat—General American Transportation Corp.

Check 5163 opposite last page.

Bulk purchasing and handling of polyethylene resins is analyzed with help of photos, diagrams, charts and tables in 24-page Polyethylene Handling Bul—U. S. Industrial Chemicals Co., division of National Distillers and Chemical Corporation.

Check 5164 opposite last page.

Limberoller bracket, which can be adjusted from 20 to 45° to control spillage and increase conveyor system capacity without expensive belt construction or disadvantages of steel rolls at steep angles, is described in Varytrough Bul—Florida Conveyor & Equipment Company.

Check 5165 opposite last page.

Case depalletizer, which can be adjusted from one size to another with turn of switch and can be equipped to depalletize a variety of pallet-stacking patterns, is subject of Model 300 Bul—Alvey Conveyor Mfg. Company.

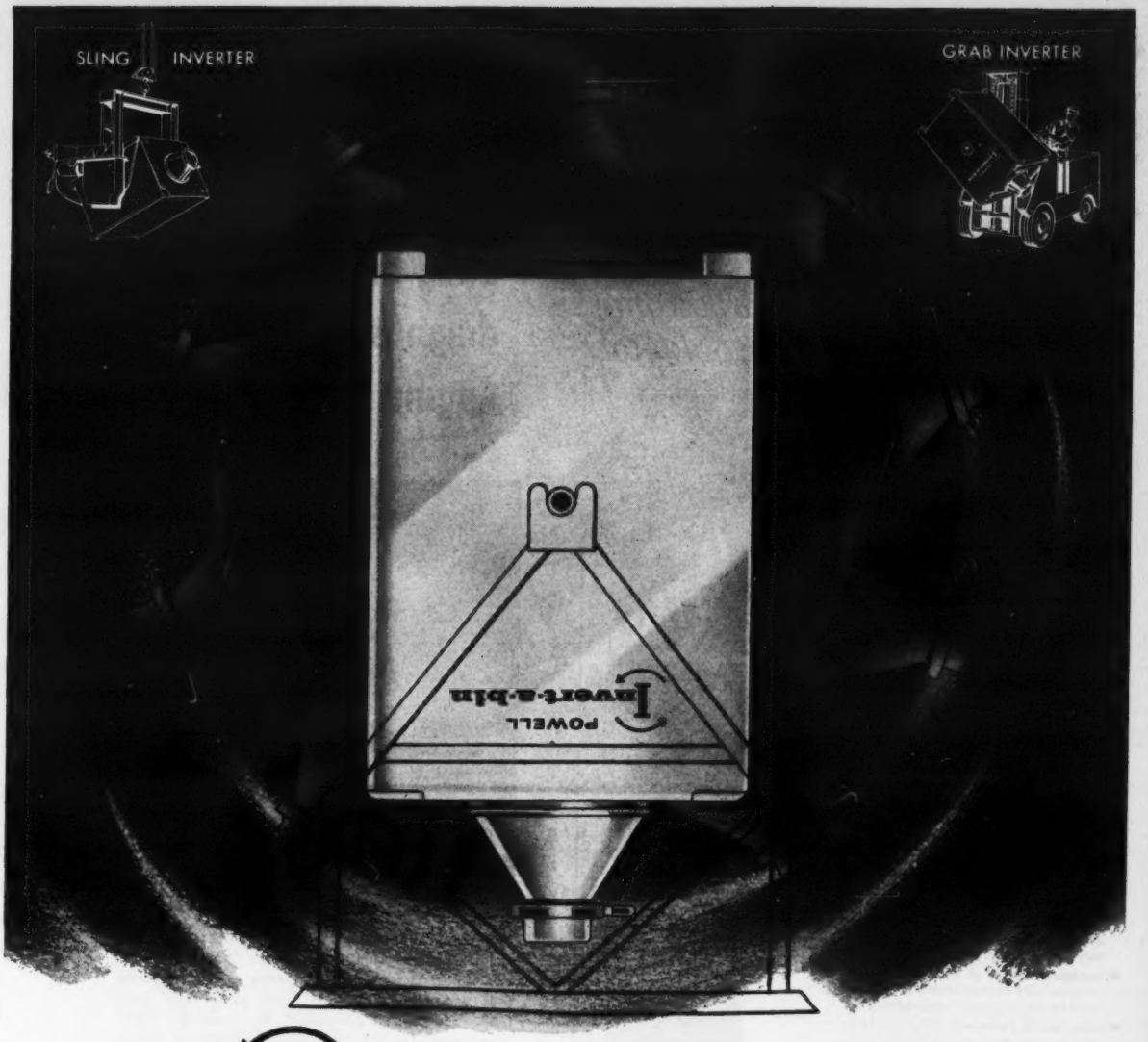
Check 5166 opposite last page.

Palletless handling is subject of eight-page Pallet or Palletless Bul —Automatic Transportation Company, division of The Yale & Towne Manufacturing Company.

Check 5167 opposite last page.

Negative-pressure pneumatic conveyors are described, applications cited and design data given in Bul 18-G—Sprout, Waldron & Co., Inc.

Check 5168 opposite last page.



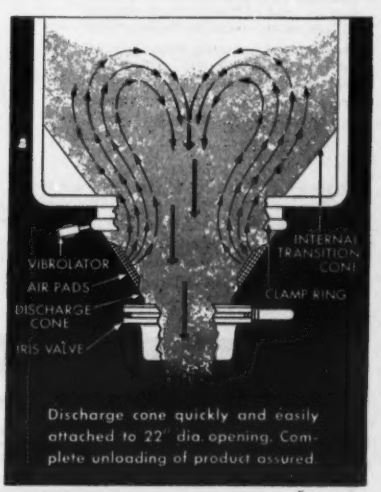
Powell Invert-a-bin® *can be tumbled, vibrated and aerated!*

The most difficult of materials can now be semi-bulk handled. Ideal for in-plant and inter-plant handling. Fine materials such as chalk, clay, cement, whiting, polyvinyl chloride, titanium dioxide, talc, etc., which pack and densify in transit and storage, can now be handled with ease in the Invert-a-bin®.

The ability to rotate or tumble the Invert-a-bin® in the sling type, floor type, or lift-truck grab attachment just prior to discharge restores material to flowable condition. Flowability is further improved by aeration and vibration attachments on the discharge cone—also a partially filled Invert-a-bin® can easily be taken off stream.

Should you be having handling problems with your products, send us a sample for our recommendation. Invert-a-bin® could be your answer to reducing handling costs.

Our Invert-a-bin® sales manager, Lew Lubenow, or our representative in your area is available to assist you in making an engineering and economic survey.



Discharge cone quickly and easily attached to 22" dia. opening. Complete unloading of product assured.

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Check 5169 opposite last page.

Want help in cutting valve costs?

Get These Rockwell-Nordstrom Lubricated Plug Valve Booklets

- **Semi-Steel Valves** and accessories for normal temperature, normal pressure services. Bulletin V-203.
- **Corrosion Resisting Valves** in brass, Monel, stainless steel, bronze and other corrosion resistant patterns. Bulletin V-217.
- **Coated Valves** with new, special corrosion resisting coatings factory-applied to standard valves. Bulletin V-614.
- **Hypersphere** lubricated spherical plug valves for 16" to 30" gas and liquid lines. Bulletin V-607.
- **Power Operators** for pneumatic, hydraulic and electric control and remote operation. Bulletin V-214.
- **Condensed Catalog** on Rockwell-Nordstrom lubricated plug valves plus data on Rockwell liquid and gas meters and pressure regulators.
- **Steel, 1500-lb. Valves** with round opening for many services requiring full opening valves in smaller sizes. Bulletin V-611.
- **Lubricating and Servicing Instructions** for Rockwell-Nordstrom lubricated plug valves. Bulletin V-218.
- **Lubricant Recommendations** for genuine Rockwell valve lubricants specially prepared for wide variety of services. Bulletin V-220.
- **Maintenance & Instruction Manual** gives full data on valve fundamentals, assembly and specific field maintenance instuctions. V-616.
- **Water Transmission Valves** for public commercial-industrial installations. V-612.

Whatever your valve needs, you can select from the Rockwell-Nordstrom complete line of lubricated plug valves, lubricants and plug valve accessories. Write today for details: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

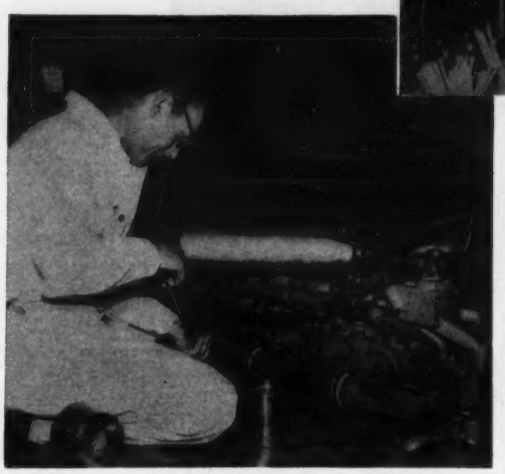
another fine product by

ROCKWELL

Check 5170 opposite last page.

CP IDEAS: from other industries and nuclear field — new trends in research, process, services

Long-distance diagnoses of engine ailments... save truck line $40,000/yr



Maintenance man (left) draws an oil sample with special suction gun from truck. Gun is inserted into dip stick tube same distance as stick, assuring that sample is obtained from same level each time. Sample is air-mailed to Oakland, Calif., laboratory (right) for analysis. Sample being tested has silicon content of 12 ppm

Oil samples from 800 far-ranging units are sent every 7500 miles to central laboratory where direct-reading spectrometer measures foreign elements and tips off mechanics to impending trouble

Laboratory technicians in Oakland, Calif., are diagnosing ailments of diesel truck engines as far away as Portland, Ore., and Chicago, Ill.

Their reports range from advising the mechanic to check a crankshaft for bearing wear to suggesting that there is a hole in an air intake tube.

The chances are that the laboratory technician who made the diagnosis has never seen the ailing truck, but the mechanic knows from past experience that he'll find the trouble indicated.

In fact, in actual cases, prompt follow-up saved the crankshaft so that it could be re-used, and the mechanics found a hole in the air intake tube of a truck.

The laboratory doesn't have a crystal ball, but it does have a spectrochemical instrument that almost instantly analyzes motor oil and translates the data into readily-usable form.

A $40,000 investment, the instrument was adopted by Pacific Intermountain Express of Oakland to check lubricating oil samples from its more than 800 trucks for signs of engine wear and contamination. Savings in operation and maintenance costs have recovered the cost in less than a year.

Key to the system is the fact that various parts of the engine are composed of different elements or alloys. Abnormal wear increases the amount of the associated element or alloy present in the oil.

In the case of the seared crankshaft, an abnormal increase in iron, copper and lead content of the oil led to the deduction that a copper-lead bearing was wearing on the iron crankshaft.

Leaks and contamination can be spotted by measuring other elements. High silicon content (silicon can enter engine as dust through a faulty air intake system) exposed the leak in the

hose cited earlier.

Presence of boron could indicate leakage of cooling water into oil; iron could point to cylinder-wall wear; chromium, piston-ring wear; and aluminum, pistons wearing.

Samples of oil are drawn at operating temp every 7500 miles from the crankcase of each engine, and placed in cans for mailing to Oakland. Engine number and mileage data accompany the sample.

At Oakland the oil is analyzed and the amount of each element present is recorded on a card. Critical points, based on normal conditions and engine mileage, have been established for each element.

In addition to analyzing the oil with the spectrochemical instrument, the lab checks the flash point of oil for indication of fuel dilution or soot; oil viscosity for flow characteristics and lubricating ability; and total dirt and heavy particles for overall contamination.

If any of these tests indicate trouble, the maintenance department is notified.

P.I.E.'s analyzer is equipped with 16 indicator dials, calibrated for the following elements and concentration ranges:

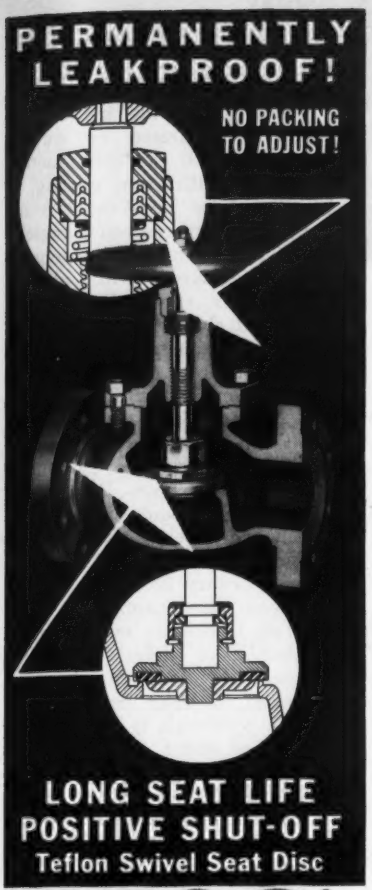
Iron, lead, copper, chromium and boron, 1.0 to 500.0 ppm; tin, 1.0 to 100.0 ppm; silicon, 1.0 to 200.0 ppm; aluminum, 1.5 to 500.0 ppm; silver, 0.1 to 30.0 ppm; phosphorus, zinc, calcium, and barium, 0.01 to 30.0%; magnesium, sodium, and potassium, 0.0005 to 0.005%.

Results are read directly from a logarithmic scale.

Samples, which come into the lab from all of the 40 terminals scattered over the area between Chicago and the west coast, are analyzed directly as received by use of a rotating-disc, electrode technique — eliminating intermediate sample preparation.

A graphite disc is rotated in a small boat holding the oil sample so that a continuous film of oil is subjected to a high voltage spark.

This causes the various elements in the oil to emit light



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TA SERIES GLOBE AND ANGLE VALVES

Exclusive Teflon V-Ring Pressure Seal. Spring-loaded for tight seal at low pressures. V-shaped seal expands under added pressure. No packing to cause binding of stems. Eliminates hard-to-turn handles.

Teflon seat disc for long seat life. Teflon and Ductile Iron construction makes valve highly versatile.

For service temperatures from 0° to 212° F., pressures to 400 psig WOG, sizes ½" to 3"

RegO—Pioneers in the design and manufacture of compressed Gas Control Equipment

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...a must for corrosive or volatile fluids!

The smooth bore of Kuhns ductile iron fittings, plus their basic resistance to corrosion, high yield strength of 45,000 psi, and excellent thermal shock resistance mean greater safety and less downtime when you're piping corrosive or volatile fluids.

Available in a wide selection of sizes in flanges and flanged fittings, screwed fittings, couplings and special purpose components, these rugged, long lasting "D.I." products assure extra years of service.

Simplify your maintenance problems and reduce operating costs with the fittings listed and pressure rated by the Underwriters' Laboratories, Inc.

The Kuhns Brothers Co.

1800 McCALL STREET • DAYTON, OHIO
Cast, ductile and malleable iron fittings

Check 5172 opposite last page.

New! Proven! Approved! National Airoil Type C-45 PACKAGE Oil Burner

Pressure Atomizing Burner specially engineered and approved by Underwriters' Laboratories for use with Nos. 4 and 5 commercial fuel oils

For No. 2 oil, specify the C-20 oil burner, available in the same sizes and models as the C-45 oil burner, for natural or induced draft or "pressurized" boilers.

QUIET HEATING AT LOWEST COST IN BUILDINGS REQUIRING UP TO 12,000 SQUARE FEET OF RADIATION

RUGGED DESIGN AND PRECISION CONSTRUCTION

EASY TO INSTALL—MINIMUM INSTALLATION COSTS

EASY STARTING, HIGH TEMPERATURE FLAME, GOOD COMBUSTION

SPECIALLY DESIGNED FOR USE IN STANDARD FIRE BOX BOILERS OR IN THE LATEST TYPE SELF-CONTAINED BOILERS FOR NATURAL OR INDUCED DRAFT OR "PRESSURIZED"

EXCELLENT REPLACEMENT FOR LIGHT OIL BURNERS UP TO 33 GPH

CHECK THESE ADVANTAGES

- No float valves to stick open or closed.
- No oil level to maintain.
- No air compressor or multipistons to lubricate, maintain or replace.
- Simple standard parts.
- A unit that is easily understood and serviced by any good oil burner mechanic.
- As easy to install and service as a residential gun type oil burner.
- All controls, except limit switch and thermostat, are mounted in enclosed control cabinet, factory wired and tested, with terminal block coded for easy field connections.
- All air needed for combustion is furnished by burner blower—no secondary air openings are required.
- Prepurge of cold oil and delivery of hot oil, of proper viscosity, right at the nozzle, before burner start. This insures easy, smooth start every time.
- All valves and component parts are included.
- Electronic combustion safety controls, with response of 0.8 seconds on flame failure, provide utmost in safety and meet all requirements of Underwriters' Laboratories.

Bulletin 100 contains complete data on the Type C-45 Oil Burner in its several natural or induced draft models and pressurized model. Write for a copy today.

NATIONAL AIROIL BURNER

Established 1912
Incorporated 1917

NATIONAL AIROIL BURNER COMPANY, INC.
1284 E. Sedgley Avenue • Philadelphia 34, Pa., U.S.A.
Industrial Oil Burners, Gas Burners and Combustion Equipment

Check 5173 opposite last page.

of characteristic wavelength which enters the instrument and is separated by wavelength with a three-meter concave diffraction grating.

The light is reflected from the grating or specific angles, depending on the wavelength and measured with photomultiplier tubes. Parallel readout channels are identical and interchangeable without recalibration, increasing the instrument reliability.

As a result of the program, oil and filter consumption has decreased, as have engine maintenance costs. Previously, engine oil and filter were changed every 15,000 miles and engines overhauled routinely every 225,000 miles.

Now these are done only when laboratory tests indicate trouble or defects are detected by maintenance personnel. Mileage between engine overhauls is expected to average about 450,000 miles.

Other benefits from the system include better direction of maintenance; salvage of parts which can be repaired instead of being replaced when wear is detected early; and minimization of emergency breakdowns.

The laboratory is now trying to utilize similar techniques on transmissions and differentials. These are currently drained and refilled every 75,000 miles. Average service life is 200,000 miles on transmissions and 350,000 miles on differentials.

(Direct Reader spectrometer is product of Baird-Atomic, Inc., Cambridge, Mass.)

Check 5174 opposite last page.

Use of urethane foams patent offered by Mobay

Royalty-free licenses for use of U.S. Patent 2,948,691 pertaining to reaction products of polyether resins and polyisocyanates are being offered to foam producers.

Initial commercial importance of the patent lies in production of so-called polyether-based urethane foams.

(Licenses are being offered by Mobay Chemical Company,

jointly-owned associate company of Monsanto Chemical Company, St. Louis, and Farbenfabriken Bayer A.G., Leverkusen, Germany, Pittsburgh 5, Pa.)

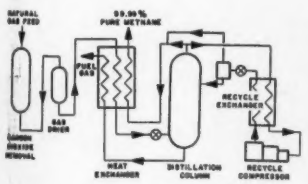
Check 5175 opposite last page.

Compact 'cold box' houses plant for producing ultra-pure methane

A single compact "cold box" houses purification plant designed to refine methane-rich natural gas into ultra-pure methane (99.99%) for Allied Chemical Corporation's Solvay Process division at Moundsville, W.Va.

Solvay will use ultra-pure methane in manufacture of chlorinated hydrocarbons.

Methane is processed at liquid temperatures (very low) which require only a fraction of space used in the warm type of purification process.



Methane-rich feed gas (see flow diagram) enters a caustic scrubber for removal of CO_2. It then enters one of two alumina-filled drier vessels, used alternately so that one may be reactivated while other is in use.

Dried feed is then cooled in the heat exchanger by outgoing fuel gas and pure methane product from the column.

Leaving exchanger, feed gas goes through an expansion valve where it drops in temp before entering the distillation column. Here methane is separated from the heavier hydrocarbons.

Pure methane is taken from the top of the column as a gas while heavier hydrocarbons are withdrawn from the bottom as liquid and passed back through the heat exchanger to recover the refrigeration.

Pure methane from the column is divided into two

WHY IS THIS A BETTER PUMP?

Because . . .

Vanton Sealless Plastic Pumps do not have troublesome shaft seals and stuffing boxes. They do not leak, do not contaminate pumped medias and have a longer service life than most standard chemical pumps.

What's more Vanton corrosion resistant Sealless Plastic Pumps are self-priming and handle fluids, gases and slurries with equal ease. They're easy to install and easy to maintain.

Vanton's unique non-agitating pumping action prevents breakdown of sensitive fluids. Because there are no check valves or gaskets required, troublesome maintenance problems associated with these parts are eliminated.

There is a Vanton Pump to handle most every chemical, corrosive fluid, abrasive fluid and their combinations within the temperature and pressure limitations of the pump.

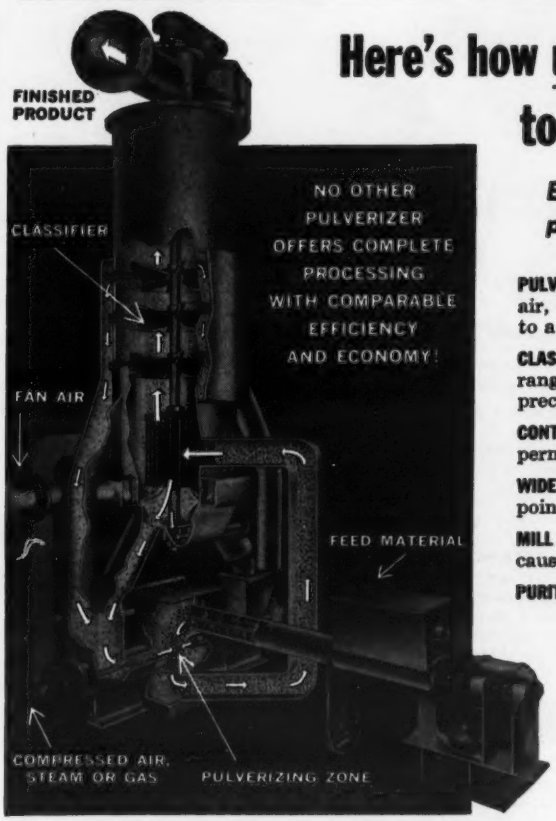
Vanton pumps are available in capacities to 40 GPM, to discharge pressures of 40 PSI and temperatures from —60° to +350° F.

For facts about a Vanton Sealless Plastic Pump for your process operation write for booklet #10A.

Vanton PUMP & EQUIPMENT CORP.

DIVISION OF COOPER ALLOY CORP., HILLSIDE, N. J.

Check 5176 opposite last page.



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Economy and efficiency of exclusive Jet-Stream collision process unmatched by any other pulverizer!

PULVERIZES by collision of particles in high velocity jet streams of air, steam, or gas. Produces particle sizes as coarse as ⅛" down to a top size of a few microns.

CLASSIFIES with unusual efficiency and accuracy within a broad range of variable settings. Classifier integral but separately and precisely controlled.

CONTROLS HUMIDITY, dries, blends or coats material as desired. Even permits chemical reactions.

WIDE RANGE OF MATERIALS can be handled from soft low-melting point organics to hardest abrasive materials.

MILL WEAR and maintenance are reduced to absolute minimum because particles collide with each other instead of wearing mill.

PURITY is maintained at highest level because of minimum mill wear.

Sizes available for lab, pilot plant and production use.

Write today for detailed information or visit by qualified Majac representative.

MAJAC, INC.

Twenty-third St., Sharpsburg, Pittsburgh 15, Pa.

Designers and manufacturers of pulverizing, classifying and separating equipment for industry.

Check 5177 opposite last page.

streams. One goes into main heat exchanger to cool incoming feed stream and emerge as methane product at ambient temp.

The other stream is passed through the recycle heat exchanger and is compressed by the recycle compressor. The high-pressure stream then goes out through the recycle heat exchanger where it is cooled by incoming product.

Methane is then expanded to form liquid for refluxing the column. The gas portion of the reflux stream is removed in the phase separator and joins the product stream from the top of the column.

(Methane purification plant was designed and built by Air Products, Incorporated, PO 538, Allentown, Pa.)

Check 5178 opposite last page.

Problem of heat loss in nuclear power plants tackled

For the first time, two advanced forms of power generation have been combined to convert the heat of fission inside a nuclear reactor directly into electricity.

The experiment which produced about one watt of power in demonstrating the feasibility of this approach, involves building a fuel element with a thermionic generator in its center and a thermoelectric generator surrounding it. This assembly is then inserted into a reactor.

One of the drawbacks to today's nuclear-powered generating stations is the significant inherent power loss caused by the large temperature drop from the center of the fuel elements to the outside surfaces in contact with the cooling water.

While some fuel elements themselves reach 4000°F temp in the fission process, nuclear scientists can get only about 600°F temp out of the fuel elements and into the water.

The approach of combining the two power forms was adopted because while both methods operate on similar principles, they operate most

How the bottleneck in packed tower Support Plates and Distributors

When towers were filled with the packings available a few years ago, a plate with a few holes was all that was needed to support the packing, and a few streams of liquid all that was needed to wet it.

Low in efficiency, low in capacity, low in flooding limits, the packing itself was the bottleneck to effective mass transfer.

But the bottleneck shifted from packings to support plates and distributors when high-efficiency, high-capacity packings, such as Intalox Saddles and Pall Rings, were developed. Higher flooding limits of the new packings were meaningless with the low flooding limits of the available support plates. Higher gas handling capacities of the new packings were stymied by the poor gas handling capacity of the support plate. The greater surface area and better internal distribution characteristics of the new packings could not be used to their maximum value because of poor initial distribution from the distributor plates available.

Our engineers went to work. Scale models of design after design were given preliminary tests in a four inch tower. Those that showed promise were made in a 30" size and subjected to test run after test run in our large experimental towers. Field experience in towers up to 10' in diameter was then evaluated against our test findings.

The "gas-injection" principle in support plates was one result of this intensive program. The "weir-flow" principle in distributor plates was another.

Today, U. S. Stoneware produces a wide range of support plates and distributors based on these principles which permit the engineer to utilize to the full the high performance characteristics of Intalox Saddles and Pall Rings in effecting mass transfer.

A few of these *are* illustrated and described briefly on these two pages. Full technical data is given in Engineering Manual TA-40 sent free on request.

FOR HIGHEST EFFICIENCY, HIGHEST CAPACITY COUPLE "U. S." TOWER PACKING WITH "U. S." TOWER ACCESSORIES

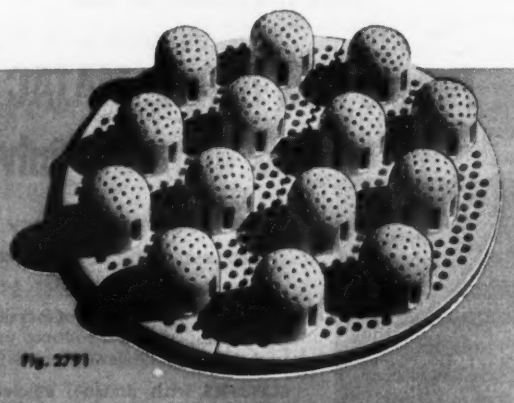


Fig. 2791

CERAMIC "GAS-INJECTION" SUPPORT PLATE
Slotted risers with perforated caps inject the gas into the tower. Liquid leaves the column through holes in the base plate. All plates through a size range from 12" through 60" have an effective working free area of better than 50%.

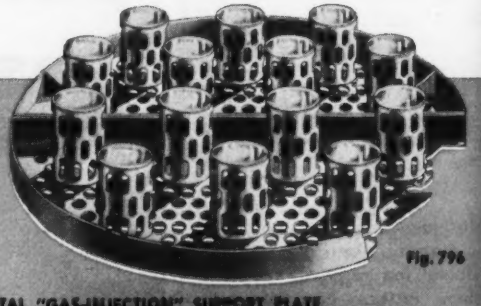


Fig. 796

METAL "GAS-INJECTION" SUPPORT PLATE
Similar in design to Fig. 2791; for towers from 4" dia. through 48"; percentage of free area generally exceeds 75%. Available in carbon steel, stainless steels, aluminum, copper, nickel, or any of the weldable alloys.

"WEIR-FLOW" CERAMIC DISTRIBUTOR
Cylindrical risers with "V" notches serve as downcomers for liquid, permitting greater flow as the head rises. The plate is supported on lugs which permit an annular space between distributor and tower wall through which gas rises. Ceramic "weir-flow" distributors are available for towers from 24" dia. through 96".

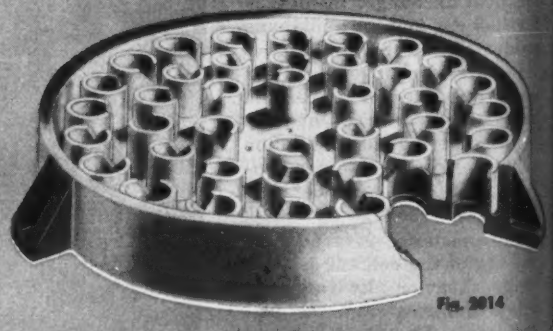


Fig. 2814

performance shifted to AND WHAT WE HAVE DONE ABOUT IT!

"MULTI-BEAM" METAL SUPPORT PLATE
With a free area generally exceeding 85%, this "gas-injection" design principle is available in separate metal beams to fit towers up to ten feet or more in diameter. Number of sections vary from three to ten.

SPECIAL SUPPORT PLATES
Special support plates incorporating the "gas-injection" principle are available fabricated from impervious graphite, fiberglass reinforced polyester resin, or titanium.

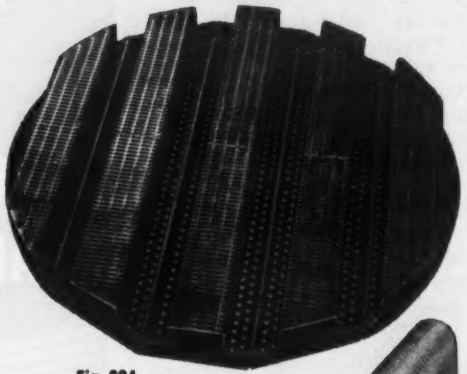


Fig. 804

METAL "WEIR-FLOW" DISTRIBUTORS
The basic "weir-flow" principle is shown here incorporated into a sectionalized metal distributor. Plates of this type can be made to fit towers of unlimited size. Metal "weir-flow" distributors are also available in one- or two-piece construction for towers up to 48" in diameter.

Fig. 798

"MULTI-BEAM" CERAMIC SUPPORT PLATE

Fig. 2808

For towers of 24" diameter up through 108". Made in the form of multiple beams for installation through manways. Has twice the load bearing capacity of Fig. 2791, even greater free area, yet retains all the advantages of the "gas-injection" principle.

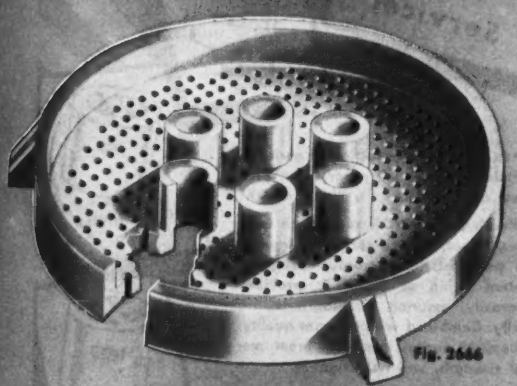
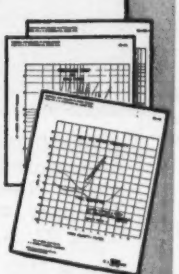


Fig. 2666

CERAMIC "ORIFICE" DISTRIBUTOR
This new distributor, on which patents are pending, is unique in that it offers the user a choice of three liquid rate ranges, enabling him to match his distributor to his flow requirements. For example, in a size to fit a 48" tower, Fig. 2666 is available for a liquid rate ranging from 12 to 50 gpm., or from 50 to 113 gpm., or from 113 to 414 gpm. This new distributor is made in chemical porcelain or in heat-shock resistant chemical stoneware in sizes to fit towers from 10" in dia. through 60".

ARE YOU RECEIVING THESE REPORTS FROM OUR CONTINUING RESEARCH INTO PACKED TOWER PERFORMANCE?

In our engineering laboratories, in a series of absorption and distillation towers up to 30" in diameter, we are continually evaluating the performance of tower packing and tower accessories under a wide range of operating conditions. If you would like copies of these studies please write us on your letterhead. Ask, too, for a copy of Engineering Manual TA-40.



Process Equipment Division

U. S. STONEWARE
AKRON 9, OHIO

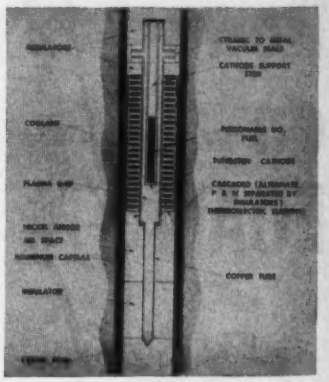
258-G

New York • Chicago • Houston • Los Angeles

Check 5179 opposite last page.

efficiently at widely divergent temperatures.

A thermionic generator operates at about 3500°F but won't function efficiently below 2700°F. A thermoelectric



Thermoelectric-thermionic device (cross-section) was designed to demonstrate feasibility of such a system for more efficiently converting fission heat into electricity

generator functions well in the 600 to 1800°F temp range, but less efficiently at elevated temperatures.

By putting the two types of generators in tandem, heat passing through the thermionic generator flows through the thermoelectric unit. The elements are wired in series to give a combined electrical output over a wide temp range.

(Thermoelectric-thermionic power generating experiment was conducted by scientists in the atomic power department of Westinghouse Electric Corporation, Box 2278, Pittsburgh 30, Pa.)

Check 5180 opposite last page.

Centrifugal lining process permits high-speed pail production

A bottleneck which blocked high-speed production of high quality, lined steel pails has been eliminated with adaptation of centrifugal lining process to pail manufacture.

Lining material is fed into disc-shaped applicator head, revolving at high speed, and then impelled centrifugally on-

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POSITION _____

COMPANY _____

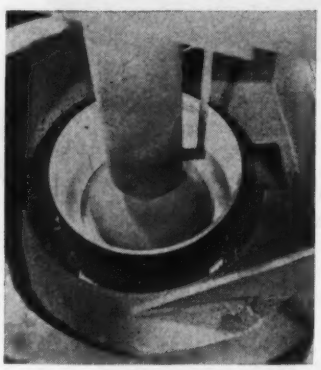
ADDRESS _____

Check 5181 opposite last page.

to the wall of the container. This method avoids use of turbulence-causing air that may entrain dirt and trap air bubbles between lining material and pail body.

Trouble-causing turbulence is also avoided by elevating the pail body automatically on the same axis as that of the rapidly-revolving centrifugal applicator. Lining material is deposited on both upward and downward travel.

Centrifugal process requires less solvent in coating formulation, avoiding possibility of excess solvent being trapped in lining and causing bubbles that break during curing and become pinholes in finished coating.



Spinning rotor of centrifugal pail-lining equipment is shown as body of five-gal pail starts up-and-down pass to receive specification lining

After linings are applied, pails are moved automatically into high-bake ovens where temp and speed of travel through the oven can be regulated to provide optimum curing.

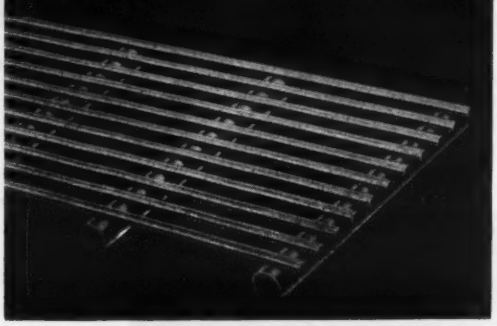
(Centrifugal lining process is development of Container Division, Rheem Manufacturing Company, 400 Park Ave., New York 22, N.Y.)

Check 5182 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

BEE ZEE

SCREENS THAT MAKE YOU MONEY



Your product has to be best . . . . and so do your screens. Your present equipment can be equipped with Bee-Zee Screens, round-rod as shown at left or in any of the special rod shapes shown below. Screens are all-stainless-steel and *all-welded,* with electronic control spacing the rods precisely. Find out how Bee-Zee Screens turn problems into profit — to make you money. Wire, write or phone Galesburg DIckens 2-5154 collect.

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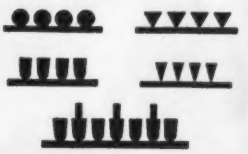
7100 Abingdon St., Galesburg, Ill.



Bee-Zee Screens in a wide variety of shapes and sizes meet the needs of leading firms in the coal, minerals, quarry, oil, food, chemical, plastic, brewing, distilling, pulp and paper, rubber and other industries.

Check 5183 opposite last page.

KNOX

TOWER PACKINGS Designed for Service!

More than 35 years production experience in the field of fine quality porcelain, plus the finest of materials . . . That's KNOX!

Tower Packings by KNOX resist high temperatures, fumes, vapors, corrosion, liquids, alkalies and acids. Non-porous—complete vitrification firing at 2300° F. provides zero porosity, assuring an indefinite life chemically. Combined with uniform quality, high chemical purity, iron-free, great mechanical strength, will not crumble.

Body composition excells the most exacting requirements.

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Always Specify **KNOX** *Tower Packings*

Check 5184 opposite last page.

CUT FUEL BILLS 20% WITH A LJUNGSTROM® AIR PREHEATER

The world's largest fluid catalytic cracker at Esso's Bayway Refinery is equipped with a new Ljungstrom Air Preheater. This picture shows the half-ton cold-end elements being installed in the Ljungstrom rotor.

Your biggest refinery operating expense is the money you burn: fuel costs. You can chop fuel bills ⅕ with a Ljungstrom Air Preheater, and here's how:

Your fuel bill drops about 1% for every 45-50°F you raise the temperature of combustion air. Ljungstroms now in service raise the air temperature 1000°F or more — and the rest is simple arithmetic. With a Ljungstrom, four barrels of fuel do the work of five. On fuel savings alone, one eastern refinery came up with net savings of $67,800 in the first year they used a Ljungstrom.

SAME FUEL, MORE HEAT. Ljungstrom economy is flexible economy. If total throughput is more important to you than fuel savings, a Ljungstrom can help boost the capacity of a pipe still at least 10% a day, without any increase in fuel consumption.

THESE ARE FACTS backed up by 25 years of Ljungstrom performance in refineries all over the world. But they're not the only facts. To find out about Ljungstrom's low-cost maintenance, easy inspection, in-service cleanability, space-saving compactness, call or write The Air Preheater Corporation for a free copy of a brochure called "The Ljungstrom Air Preheater for Process Equipment."

For more information on product at right, specify 5185 see information request blank opposite last page.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

As a public service to those in business and industry who are responsible for the protection of lives and property from the hazards of fire.

FIRE RESISTANT INCOMBUSTIBLE FLAME RETARDANT FIRE PROOF PROVE IT! FLAME-PROOF NON-FLAMMABLE

MATERIALS FOR PROTECTION OF THERMAL INSULATION AGAINST FIRE DAMAGE

FIRST, to clear up a common misconception about materials used to protect thermal insulation; no coating, sealer, or adhesive can by itself prevent fire damage. In fact, certain products without fire-retardant properties many times will actually cause fire and flames to spread; while products containing fire-retardant properties can at best only retard the spread of flames by the reduction of available fuel.

Over the years many ambiguous and ill-defined terms have been used to describe fire resistant properties of materials in literature, specifications and other published data. Words and phrases such as incombustible, flame-proof, non-flammable, fire resistive, and even fireproof have been attached to products used for the protection of thermal insulation. In many cases where the use of these terms was based on unrecognized and inadequate test methods, the products actually fed fuel to the flames rather than retarding them.

The only accepted measure of fire hazard in coatings is the flame-spread value. The confusing phrases used above do not give in exact terms the flame-spread value. If the confusion is to be eliminated, Industry must adopt a standardized system of testing and terminology for use in Engineering Specifications.

The use of confusing terms can be discarded by the adoption of the rating standard known as the Flame-Spread Index, accepted and used by building codes and insurance underwriters. There are two test methods accepted by Industry for determining flame-spread values. These are the Underwriters' Laboratories' "Tunnel Test" (ASTM E84) and the National Bureau of Standards "Radiant Energy Test" (Interim Federal Standard .00136—Com. NBS). With either of these established methods, flame-spread values ranging from zero to over 200 can be determined with accuracy for all coatings, adhesives and sealers used with thermal insulation materials.

An example of flame-spread values:

A totally incombustible material such as portland cement would have a flame-spread value of zero, while a self-extinguishable synthetic resin product could be rated about 60, and a violently combustible nitrocellulose product would be rated at "over 200."

Here, also, are the flame-spread values of some popular insulation weathercoatings applied over calcium-silicate insulation:

VAPOR BARRIER ASPHALT MASTIC	
Product A	175
Product B	173
Foster C. I. Mastic 60-26	170
FIBRATED ASPHALT EMULSION MASTIC	
Product A	218
Product B	200
Foster H. I. Mastic 90-07	150
FIBRATED POLYMER EMULSION MASTIC	
Product A	290
Foster Sealfas Mastic	40
FIRE RESISTIVE VAPOR BARRIER MASTIC	
Foster Fire Resistive Mastic 60-60	35

The Solvent Problem

Flame-spread values of solvent type mastic weathercoatings are determined under solvent free conditions to simulate service conditions existing after the products have been applied and all traces of solvent have evaporated. However, during application and cure, a fire hazard will exist when flammable solvents are contained in the coating. Such solvents having a flash point lower than 100° F. are flammable and easily ignited by welding sparks, matches, electrical sparks, cigarettes, etc. Thus a product, whose flame-spread index under solvent free conditions is relatively low, could well be the cause of a disastrous fire while it is being applied if it contains a flammable solvent.

Therefore, for complete fire safety, where welding and other sources of sparks and flame cannot be avoided during application of coatings and adhesives, these products should be chosen not only for their ultimate flame-spread value, but also for their formulation with non-flammable solvents (for example, Foster Fire Resistive Mastics).

Recommendations

We urgently recommend that engineers who specify fire resistive coatings, sealers and adhesives for use with thermal insulation specify maximum acceptable flame-spread values and flash points of materials. Only by rigidly adhering to such specifications will owners, their inspectors, buyers and applicators obtain fire safe thermal insulation construction.

A Word of Caution

The mere publishing of a flame-spread value is insufficient evidence on which to choose a product. Where two products, equivalent in every other respect, are offered for fire safe service, a product with a flame-spread value of 6 should unquestionably be chosen over a product whose index is 44. *Relative* flame-spread values, then, become of vital importance in choosing fire-retardant products.

Purpose

We at the Benjamin Foster Company have been devoting many years to research, study, manufacture and promotion of fire safe products for use in the protection of thermal insulation. We have adopted a firm policy regarding our promotion of fire safe products which is:

"To cooperate with all interested individuals and organizations in the establishing of a standardized system of testing and rating true flame-spread value . . .

To publish information that will be factual and in accordance with accepted practices . . .

To avoid overemphasis of disaster conditions in the promotion of fire safety . . .

To continue our research and development of products with improved fire safe characteristics."

If there is any way we can be helpful to you or your organization in a better understanding of products for use in the protection of thermal insulation, please contact your nearest Foster Representative, or write Benjamin Foster Company, 4635 W. Girard Avenue, Philadelphia 31, Pa.

foster COATINGS • SEALERS • ADHESIVES for thermal insulation

DIVISION OF AMCHEM PRODUCTS

Check 5186 opposite last page.

IDEAS

Ultrasonic technique used to weld plastic film and synthetic fabrics

Cold bonding, threadless stitching, sealing or welding of plastic films and synthetic woven or non-woven fabrics is possible with ultrasonic welder.

Unit consists basically of an ultrasonic oscillator which feeds 40,000 cycles per second current to a special transducer somewhat resembling an oversized ball-point pen. The transducer focuses ultrasonic energy at its rounded tip which is guided gently across the material being sealed.

High frequency sound waves cause high strength interlocking of molecules on the surface of the material so sealed. Transducer is designed so that it can be manipulated by hand or mounted in a fixture.

(Sewnar plastic film welders are being introduced by Sonadyne Corporation, subsidiary of Ultrasonic Industries, Albertson, L.I., N.Y.)

Check 5187 opposite last page.

NEW LITERATURE
Ideas and New Trends

Story of propulsion, purpose, personnel and facilities of Amcel Propulsion Inc. are among features of 20-page This Is Amcel Bul—Amcel Propulsion Inc., Subsidiary of Celanese Corp., of America.

Check 5188 opposite last page.

Advantages of leasing equipment, such as freeing working capital and improving production through new equipment, are cited in Leasing Bul—Acme Associates, Inc.

Check 5189 opposite last page.

Engineering services for development of complete processing plants on a world-wide basis are detailed in 12-page Bul 8010—Dorr-Oliver Incorporated.

Check 5190 opposite last page.

Research reports on air pollution are surveyed in 12-page annotated Air Pollution Bibliography—American Petroleum Institute.

Check 5191 opposite last page.

Services and facilities for design, engineering and construction of plants for producing polymers, plastics, synthetic rubbers, monomers and organic chemicals are detailed in 16-page Brochure 910 —Crawford & Russell, Inc.

Check 5192 opposite last page.

Products and services available to chemical processing industries as result of combination of two companies is told in The C.H. Wheeler/Griscom-Russell Story—The C.H. Wheeler Mfg. Co.

Check 5193 opposite last page.

Rare earth oxides and salts of high purity are compiled and prices given in Rare Earth Oxides Price List—Research Chemicals Division. Nuclear Corporation of America.

Check 5194 opposite last page.

Aerobic digestion plants for low-cost, high degree purification of small sewage flows are presented in 12-page Bul SM-1010—Process Engineers Inc., division of The Eimco Corporation.

Check 5195 opposite last page.

Visual-graphic services for industry with emphasis on science and technology are related in Communication Techniques Bul—Communication Techniques For Industry, Inc.

Check 5196 opposite last page.

Economies in metal purchasing are explained, along with price data and technical information on wire, rod and strip available in variety of alloys. Also featured are special charts for figuring costs. Tech Data 14—Techalloy Company, Inc.

Check 5197 opposite last page.

Management guide to The Taft-Hartley Act, as amended in 1959, has been published by California Institute of Technology. Eight major categories of changes are listed in its 31 pages, including the deletion of non-Communist affidavit requirement for union officers. To obtain Bul 31, remit $1.00 direct to Industrial Relations Section, California Institute of Technology, Pasadena, California.

Soviet progress, technologically and scientifically, as revealed by current Russian books and articles is reviewed in weekly governmental publication. Subscriptions to Current Review of Soviet Technical Press may be obtained at $7.00 for six months from Office of Technical Services of Business and Defense Services Administration, U.S. Department of Commerce, Washington 25, D.C.

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  - Natural Rubber
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  - Soft-Lined Black Neoprene
  - Unlined Black Neoprene
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  - Compar Plastic
* LINEMEN'S GLOVES
  - Natural Rubber
  - (Leather Protectors, too)

Wil-Gard Neoprene Gloves take care of troublesome hand protection problems in many types of production — superior resistance to most oils, fats, greases, petroleum solvents and caustics used in modern industrial operations. Compounded with the Wil-Gard balanced formula, they do not deteriorate from age or sunlight . . . Allergen-free for tender skin, curved fingers for fine fit . . . Wil-Grip Firmhold finish and soft-lined features if desired.

Wil-Gard Neoprene is one of 10 quality lines — 70 different styles and compositions — by the Wilson Rubber Company. The Wilson Catalog gives complete information and provides a handy chart to assist in picking the proper glove for your particular application. Write to Wilson today, or contact your distributor.

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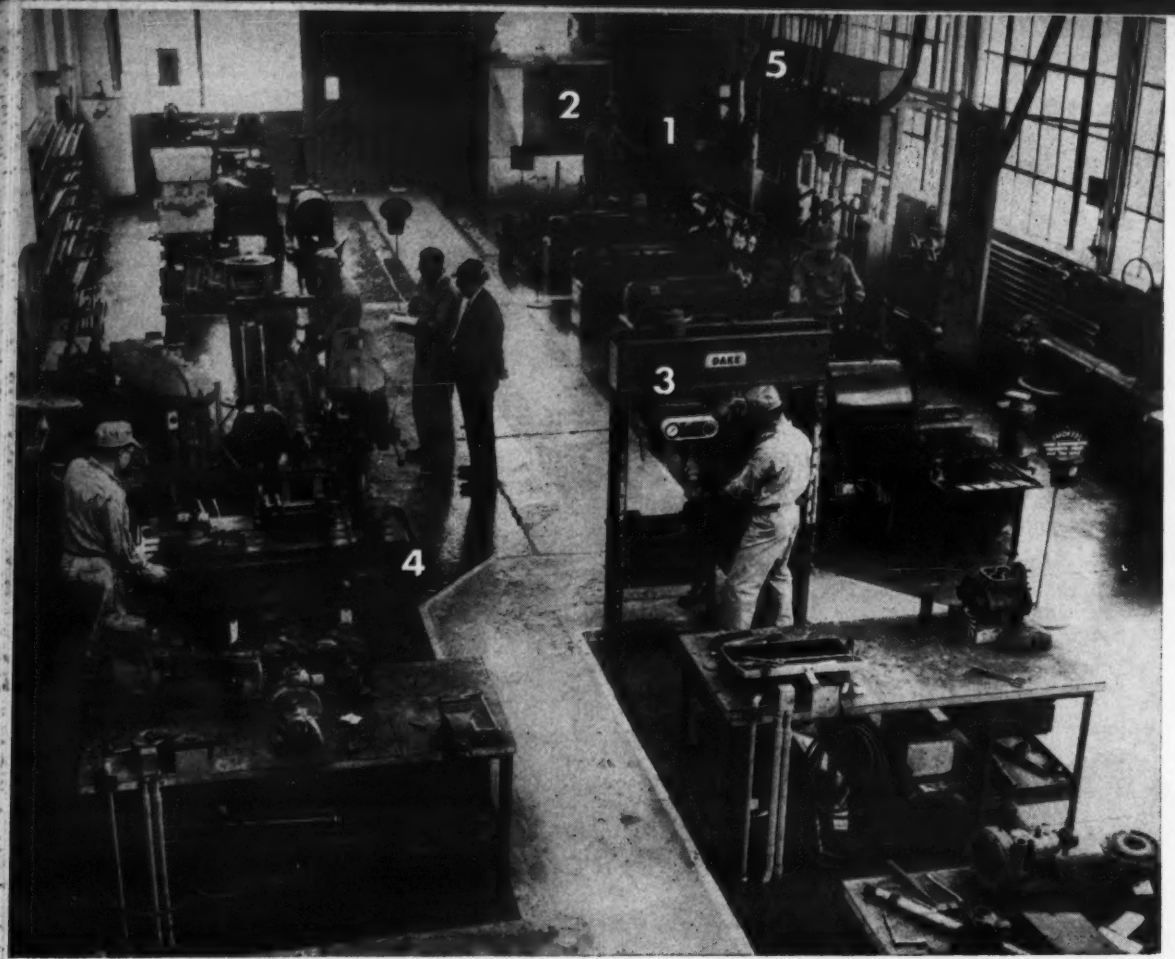
Check 5198 opposite last page.



cp

PLANT ENGINEERING MAINTENANCE & SAFETY

. . . electrical & mechanical developments

Centralized pump-repair shop at Du Pont's Chambers Works includes (1) cleaning tank, (2) ventilated booth, (3) hydraulic press, (4) drill presses and (5) two-ton traveling crane

Centralized pump repair reverses upward surge of maintenance tab

Burgeoning costs have been brought into line to the tune of a $150,000/year reduction in just three years at Du Pont's Chambers Works. The key that unlocked these savings is a centralized shop

Several years ago the rising tide of pump-repair costs threatened to engulf the maintenance budget at the Chambers Works of E. I. du Pont de Nemours & Company Incorporated. They had soared from $500,000 in 1953 to a bill of $800,000 in 1955.

This turned out to be the high-water mark. For in that same year a pump-standardization program was initiated to bring an end to the trend. This move has proved eminently successful. Repair expenses began a downward slide almost immediately. A check of the 1959 books revealed that pump-repair costs for the year had been brought back down to a $650,000 level.

The pivot position in this economy move was played by a centralized pump-repair shop started at beginning of the pump-standardization program. Prior to this, pump repairs had been conducted in six small inadequately equipped shops scattered throughout the plant. Centralization of these facilities permits single shop to be well fitted with all necessary spare parts, tools and machinery.

Virtually all of the Chambers Works' 2800 pumps (80% of which are of centrifugal type) are handled in the new shop. Despite fact that this is largest Du Pont plant, distance from farthest pump to centralized shop is only ¾ of a mile.

Layout—The shop is pictured above. It includes cleaning tank (1) in which solution strips off paint, rust, accumulated grease and dirt. Adjacent to this is ventilated booth (2) which may be used for high-pressure cleaning with compressed air, steam and water. However, this booth is used primarily to paint repaired units and give them a "new" look.

At center of shop is 60-ton hydraulic press (3) for dismantling and reassembling

parts. Beside it are two drill presses (4) which use up to one-inch-diam drills. In separate mechanical-seal-reconditioning room are surface grinder and lapping machine.

Along with usual implements, tool room contains power tools such as air-operated impact wrenches and chipping hammers. A 16" swing-engine lathe and a two-ton traveling crane (5) — with track running the full length of the shop — are other accessories.

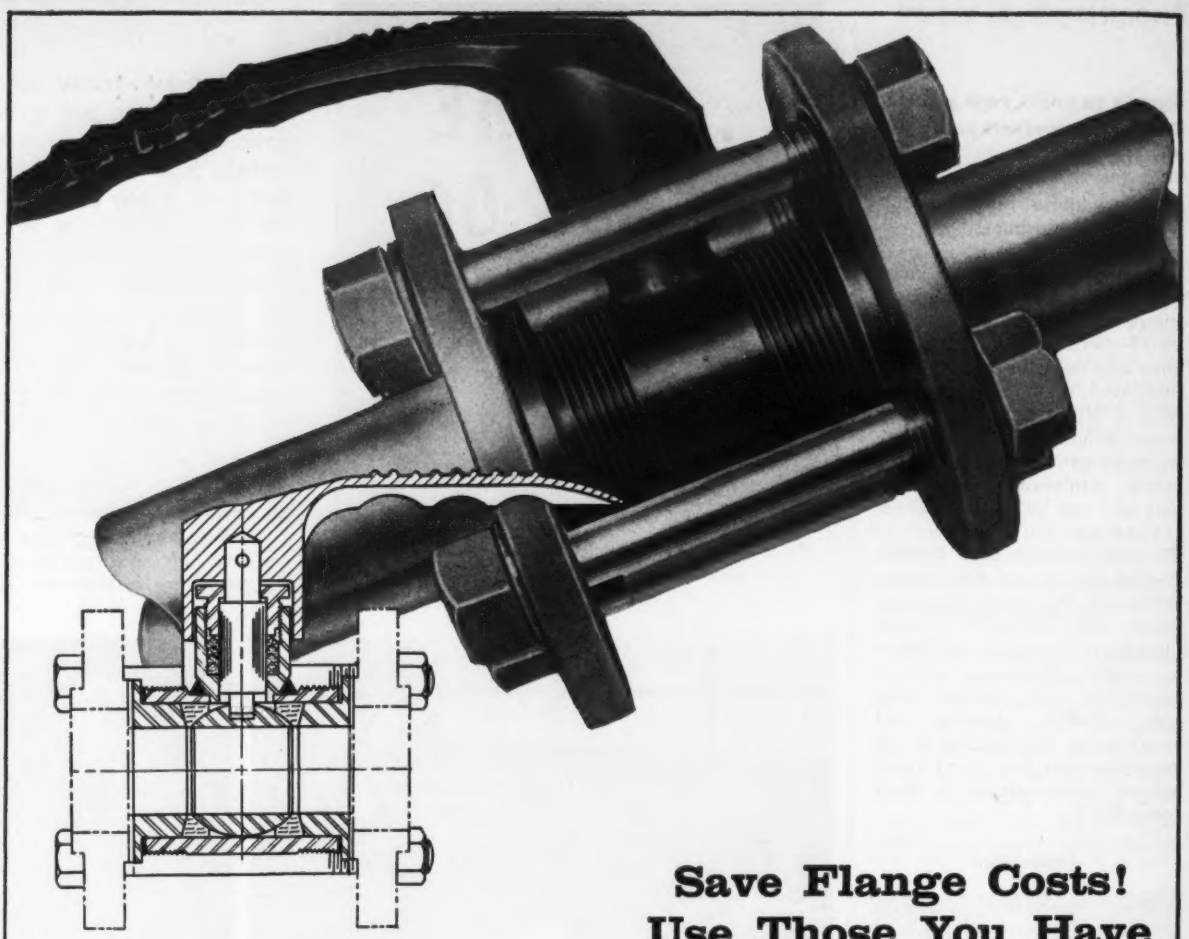
Testing—On far-right side of shop is complete system for testing hydraulic performance of new and repaired pumps. Models with capacities to 600 gpm at 300' total dynamic head may be tested for performance and efficiency. A number of multi-speed motors — from fractional- to 40-hp at synchronous speeds of 1200, 1800 and 3600 rpm — are provided at five test stands. Overloading of 50% is permissible for short periods.

Also, a pit is provided for testing vertical pumps with their own motors. Testing proves pumps before they are released, saving time and money in field.

Training—Better training of mechanics is possible through sharing of knowledge, experience and ideas. Uniform methods are developed which improve speed and quality of work. These men are required to work on many different makes, sizes and types of pumps. Due to this variety of training, skill is increased — resulting in high output per mechanic.

Clerical system — In addition to mechanical facilities, shop incorporates clerical system. This provides variety of information including outline drawings, parts lists (including materials of construction), performance curves, mechanical service bulletins, data cards (statistical information), shop-repair records and permanent Du Pont serial numbers for all pumps.

Records provide information needed for repair or replacement and readily focus attention on repetitive problems. Information accumulated and experience gained greatly aid in economic evaluation of pumps of different manufacturers in varied services. ■



Fullport Stainless Steel Flanged Ball Valve, MSS and ASA face to face dimensions, #8002, ½" through 2", 150 PSI @ 400°F. service.

Fullport Stainless Steel Screwed Ends Ball Valve #8001, ½" through 2", 1000 PSI cold non shock 300 # @ 400°F. service.

Stainless Steel Sanitary Ball Valve #8207, 1" through 2", 150 # @ 400°F. service.

Save Flange Costs! Use Those You Have

Install Fullport Compression-Mounted Ball Valves in Seconds

Fullport Compression-Mounted Ball Valves Model #8009 slip between the flanges of your present piping system with a minimum of down time. These valves which have the largest turbulence free port openings of any ball valves can handle corrosives and slurries with equal ease. The positive slotted key drive in the ball eliminates ball wear and ball wobble, permits equal flow in either direction. You get the best features of a globe, gate and plug valve in every Fullport Compression-Mounted Ball Valve —at one low price. The Teflon seats, the extra deep stuffing box and the exclusive "V" ring packing which eliminates troublesome "O" rings are Fullport extras for extra valve service and extra long life. The stem packing, if it should ever be required, can be replaced while the valve is in operation.

Fullport Compression-Mounted Ball Valves are immediately available in stainless steel in sizes ½" through 6". They test to 1000 psi cold non shock service and 300 psi at 400° F. Through bolts for compression mounting are supplied with each of these valves.

For more information about this and other Cooper Alloy corrosion resistant ball valves write for catalog #BVFA.

COOPER ALLOY

Corporation • Hillside, New Jersey

Check 5199 opposite last page.

Ready to paint your plant? Consider vinyl-alkyds for the job

Color, gloss retention outstanding attributes

Increased emphasis on color and appearance of chemical plants has opened the door for vinyl-alkyd coatings. Exposure and field tests have demonstrated that these coatings hold a bright and clean color much longer than conventional coatings. In addition, they retain minimum amounts of dirt and can be easily washed.

Coatings dry dust-free in 30 minutes and may be recoated in one to two hours. Although the products withstand salt atmosphere, most chemical resistance is limited to milder exposures such as phosphate rock, cement, soda ash, alkaline cleaners and weak acids. Application is not recommended for surfaces where temperature is kept over 130°F.

Composition

The vinyl-alkyd coatings combine the ease of application of alkyds with the excellent resistance and toughness of vinyl resins. Technically speaking, there is no specific composition range. Alkyd portion can vary from five to 95%. Most formulations however, contain from 40 to 70%.

Drying-type alkyds provide harder films. Generally, alkyds used are of the glycerol type in combination with aromatic solvents.

Not all alkyd and vinyl resins are completely compatible and their selection will affect gloss and gloss retention properties. Compatible vinyl resins include vinyl chloride and vinyl acetate copolymers. Choice of solvent is also important.

Various pigments can be used. Here too, care in selection must be observed, since some vinyl resins react with pigments such as zinc chromate, treated titanium dioxide and red lead.

Solids content of vinyl-alkyd coatings range from 30 to 40% by volume. Dry film thicknesses of 1.25 to 1.50 mils

The know-how and dedication of the men who use the precision testing equipment shown here for proving every operation in the manufacture of VOGT products is an important factor to the companies who have come to rely on the Engineered Excellence of the VOGT Equipment they buy. As an example, the constantly improved forging, finishing and inspection techniques employed in the manufacture of VOGT forged steel valves, fittings and flanges, have kept them in the forefront for safe and reliable handling of liquids and gases over a wide range of pressures and temperatures found in petroleum refineries, chemical, petro chemical and power plants.

At VOGT no manufacturing procedure is left to chance. All standard measuring instruments such as scales, verniers, calipers, micrometers, indicators, plug gates, etc. are employed with other special precision measuring instruments as shown in these pictures.

This Surfindicator electronically measures surface roughness in micro-inches. Used for "on-the-spot" testing of the surfaces of gaskets, stems, gates, seats, bonnets, etc.

This 30" Optical Comparator reveals contour uniformity and angularity of form tools and provides an elaborate inspection facility for checking formed parts for close tolerances.

A PICTURE STORY OF Quality

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LOUISVILLE 10, KENTUCKY

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New York — St. Louis
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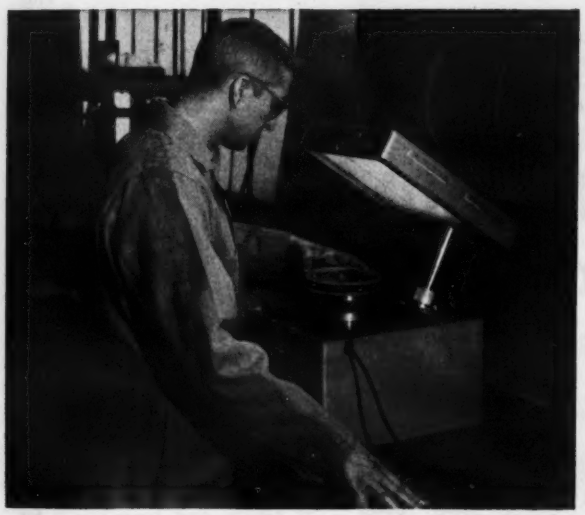
Cleveland — Los Angeles
Dallas — Camden, N. J.

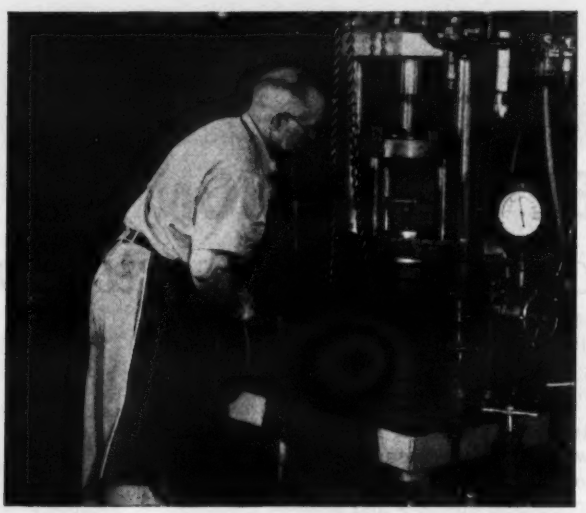
For Direct Long Distance to Louisville Dial: 502 Me 4-9411

The Balphot Research Metallograph is used for routine and research metallographic examination of the structure of materials.

Special lapping machines provide a 4-6 micro-inch finish on VOGT valve seat rings and gates for positive closure.



Optical flats, used in conjunction with monochromatic light, measure flatness and surface finish of valve gates and seat rings in terms of light bands. Flatness is held to 2 light bands or 0.000022".



Fitness to perform beyond the specified work load for which any VOGT valve is made, is proved by this final hydraulic pressure test with oil, which follows a pneumatic body and seat test with air under water.

Control

in the manufacture of Vogt Forged Steel Valves, Fittings, Flanges and Unions

ENGINEERED

by Vogt

EXCELLENCE

Check 5200 opposite last page.

are possible. Hot spray applications are excellent and will build up in excess of 2.0 mils of dry film thickness per coat.

(Condensed from technical paper "Vinyl-Alkyd Type Protective Coatings", by Austin K. Long, The Glidden Company.)

(Further information about vinyl-alkyd coatings can be obtained from The Glidden Company, 11001 Madison Avenue, Cleveland 2, Ohio.)

Check 5201 opposite last page.

Model construction kits aid engineers, designers to envision projects

Visual planning aid consisting of wooden sticks and rubber joints to make models, can simplify intricate problems for engineers and designers.

Mock-up of variety of structures, including girders, towers, trusses, etc., can be made with these components. Molecular structures can also be formed with the kits.

Wooden sticks and rubber joints are components of model construction kits which can be used by engineers and designers in preparing mock-ups

Construction kits consist essentially of colored wood sticks and rubber joints. Stick slips move into rubber joints to form rigid, stable structures. Rubber joints are available in universal and T types.

(D-Stix Construction kits are product of Edmund Scientific Company, Barrington, N.J.)

Check 5202 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

PENNTROWEL® CORROSION PROTECTION
gives longer life to new floors

In Russell, Burdsall and Ward Bolt and Nut Co.'s plant at Coraopolis, Pa., constant exposure to strong acids had deteriorated the pickling area floor to the point where replacement was imperative.

To make sure the new floor pictured above would have many years of service, RB&W selected Penntrowel corrosion resistant surfacing for concrete construction. Penntrowel Floor Surfacer was used on horizontal floor areas, and Penntrowel Regular on vertical surfaces and shallow trenches in the floor. After months of exposure to spilled pickling acids, the Penntrowel sheathing shows no sign of corrosion or erosion . . . promises outstanding service for years to come.

Fast becoming the standard surfacing material where chemical resistance or resistance from abrasion, wear and impact is required, Penntrowel has been proved in "combat". It was developed by Pennsalt for use in our own acid and alkali plants. Today, Penntrowel is being used in a cross-section of plants, both to protect new surfaces, and to repair corroded ones without costly contracting jobs and long shutdowns. It's simple to apply by hand troweling or by new spray equipment available from Pennsalt. And its price is far lower than acid brick or tile.

Acid Pickling Operation doesn't affect new floors and piers at Russell, Burdsall and Ward . . . since Penntrowel protection has been applied.

Penntrowel—
Rugged as a Rhino

Write today for complete information

Corrosion Engineering Products Dept. 358
PENNSALT CHEMICALS CORPORATION
Natrona, Pa.
Manufactured in Canada by G. F. Sterne & Sons, Ltd., Brantford, Ontario

Pennsalt Chemicals
ESTABLISHED 1850

Check 5203 opposite last page.

Tokens are legal tender in automatic dispenser for work gloves

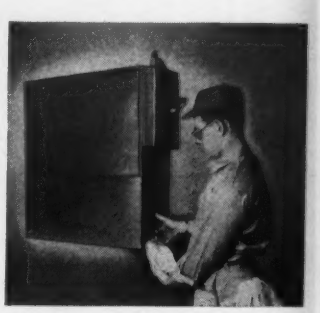
'Freeloading' & bookkeeping excesses are avoided

Uses: Dispensing work glove to employees.

Features: Automat operates on metal tokens which are passed out to workers as determined need arises. Such a system tends to reduce "freeloading" and excessive bookkeeping.

Description: Work glove automat consists of steel cabinet 35 x 32 x 9½". It is wall-hung. Design incorporates sensitive rejector to take care of slugs.

Counter automatically records each glove issued, thus



Work-glove automat has counter located independently of glove compartment to permit central-office control

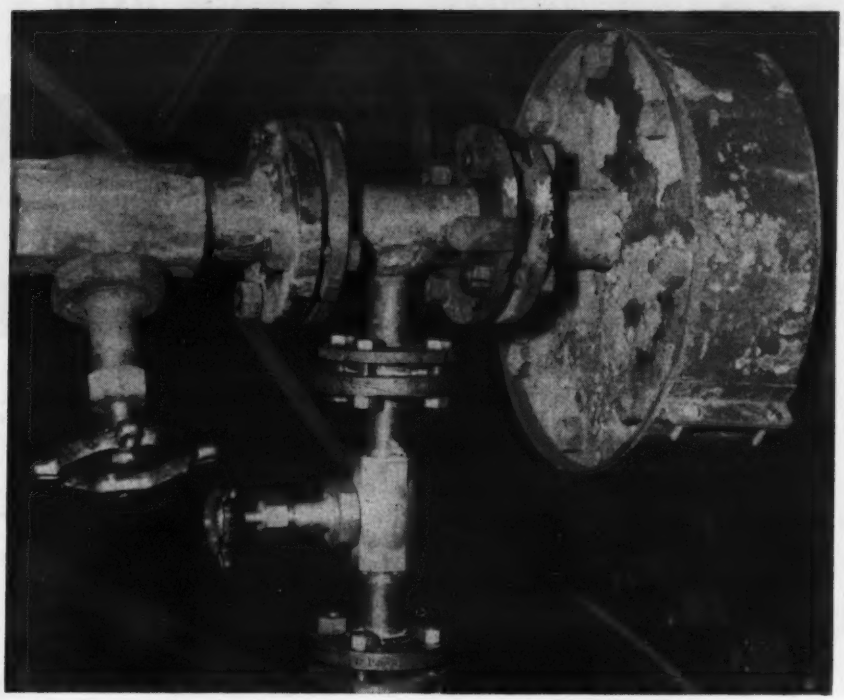
giving control data. On average, automat will load 20 pairs of gloves and have room for 40 to 60 additional pairs. Tag gloves are required for operation.

(Work-glove automat is product of Arlington Industries, 1513 N. Shore Rd., Revere 51, Massachusetts.)

Check 5204 opposite last page.

NEXT MONTH

College-level chemical-engineering principles taught to chemical operators? . . . Pie in the sky thinking? . . . Not at Hoffmann La Roche where an after-work voluntary chemical-operator education program has met with startlingly enthusiastic acceptance. The story on this successful experiment appears in these pages next month.



Bronze globe valves have performed for two years without need of maintenance on this steam line to a processing kettle heating dyestuffs

Tough globe valves turn in spotless two-year record in steam-line service

Alloy-disc units have not experienced frequent replacement-repair rate of fiber-disc predecessors at General Aniline & Film's Dyestuff & Chemical Division

Problem: Wire drawing of seats and tearing of fiber discs were responsible for a replacement-repair rate of two to three times per year for globe valves on the steam line to a processing kettle at Dyestuff & Chemical Division of General Aniline & Film Corp. in Rensselaer, N.Y.

These failures resulted each time in replacement of either the fiber disc or else the whole valve (depending on how extensive the damage had been). The result: excessive replacement-part and downtime-losses.

Solution: Bronze globe valves incorporating hardened-steel-alloy seats and discs were installed on the steam line to replace fiber-disc variety being used. Alloy used for seats and discs is rated at 500 Brinell. The flat narrow seats are brazed in valve body. Seats and discs are lapped to obtain a smooth flat seal.

Results: The globe valves have operated for two years without any maintenance, thus saving considerable time and money. This installation was actually a test; trouble-free experience with the valves has resulted in their being selected for additional installations in the plant. Right now, this model of valve is only one of bronze globe screwed type being purchased by the company.

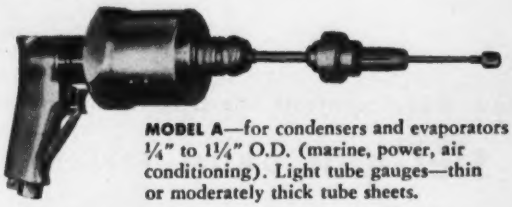
(LQ-600 globe valves are product of Lunkenheimer Company, Beekman & Waverly Avenues, Cincinnati 14, Ohio.)

Check 5205 opposite last page.

Now for every tube . . . every size . . . every type of job

WILSON
TORQ-AIR-MATIC
AUTOMATIC EXPANDER DRIVES AND ACCESSORIES

WILSON offers a complete line of Torq-Air-Matic automatic tube expander drives and torque controls. Wilson was the first to successfully develop an air driven tube expander drive that accurately controls tube expansion, by directly measuring torque output at the mandrel, without depending on frictional, ratcheting, magnetic, hydraulic or electrical devices. Hundreds are in successful use by many manufacturers and repair men the world over.



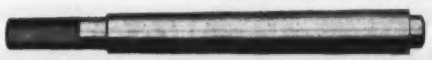
MODEL A—for condensers and evaporators ¼" to 1¼" O.D. (marine, power, air conditioning). Light tube gauges—thin or moderately thick tube sheets.

MODEL B—for heat exchangers ¾" to 1½" O.D. (oil refinery—chemical plants). Small boilers: heavy gauge tubes in thick sheets.

TUBE EXPANDERS—Wilson Models 41 and 44 Self-Feeding Tube Expanders are modern tube expanders for the *precision rolling* of condenser and heat exchanger tubes into the heavy tube sheets used in current practice.

TUBE CUTTER—Rugged and economical for use with a portable drill, for cutting off tube beyond the tube sheet.

TUBE PILOT—New Guide-Rite plastic guide inserted into tube end for easing tubes through sheet and support plates.



TUBE KNOCKOUT TOOLS—For hand or mechanical use.

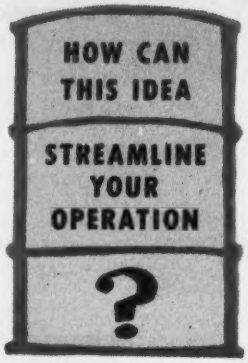
Write for comprehensive Catalog 77-88.
Representatives in principal cities
THOMAS C. WILSON, INC.
21-11 44th Ave., Long Island City 1, N. Y.
Cable Address: "Tubeclean," New York

TWBOX **WILSON**
BETTER TOOLS FOR BETTER WORK

Check 5206 opposite last page.

STERILE, COLD FILLING CHEMICAL MATERIALS IN 55 GAL. DRUMS

Here's one way *sterilpac* has streamlined the *food* processing industry: sensitive concentrates now retain their flavor, color, texture, and body without additives or preservatives—and *sterilpac*-filled concentrates *require no refrigeration!* That's one way. Write—or give us a call—to find out others.



New development for Chemical Industry . . .

sterilpac DRUM FILLING SYSTEM

by **Thermovac inc.** A subsidiary of Rheem Manufacturing Co.

816 E. Hazelton Ave. • P.O. Box 209 • Stockton, Calif. • HOward 6-4385

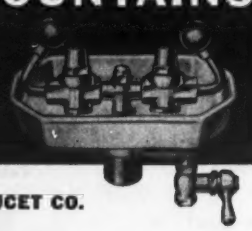
Check 5207 opposite last page.

IN EMERGENCY . . . contaminated eyes are instantly cleansed of dangerous particles and chemicals by *controlled* water streams from HAWS Emergency Eye-Wash Fountains. This "split second safety" before medical aid arrives can mean the difference between temporary eye irritation and permanent eye injury! HAWS will provide emergency facilities best suited for your safety program—minimizing hazards, reducing claims, lowering insurance costs. Get the facts by writing today for illustrated literature!

HAWS EYE-WASH FOUNTAINS

MODEL 7100
(old model 8930)

Basic eye-wash model with enameled iron bowl; quick-opening valve for manual operation; adaptable to treadle operation; chrome plated brass water pressure regulators and twin fountain heads. Wall mounted and pedestal models available.



HAWS 50 YEARS

HAWS DRINKING FAUCET CO.
Since 1909
1443 FOURTH STREET
BERKELEY 10, CALIFORNIA

EXPORT DEPARTMENT: 19 Columbus Avenue, San Francisco 11, California, U.S.A.

Check 5208 opposite last page.

Pipe-flexibility analysis turned-out in two days

Computer service that produces pipe flexibility analysis within 48 hours is now available. If needed, analysis can be provided in a few hours.

Using service, clients prepare simple description of pipe system and data sheets which are then sent into company. Company punches information into punch cards and processes it on IBM 704 computer. Cycle normally takes 12 hr, but can be stepped-up if necessary.

Reports include anchor and restraint reactions, forces, moments, and stresses at all intermediate points as well as displacements and rotations. Tangents, bends and closed loops (in any combination having any orientation) are permissible. Changes to system are easily specified since coordinates are not used in input data. Flexibility and stress-intensification factors are automatically introduced by program.

(Further information on pipe-flexibility analyses may be obtained from the Service Bureau Corporation, Subsidiary of IBM, 425 Park Ave., New York 22, N.Y.)

Check 5209 opposite last page.

Fe contamination foiled by Al-alloy pumps

Processes where ferrous contamination (eg. polyethylene processing) and/or light weight are important considerations should be prime market for line of Al-alloy pumps. Rated capacities are 5 to 3000 gpm, heads to 550′.

Main design feature of line is axial flow diffuser said to assure higher efficiency, while maintaining complete hydraulic balance at all flow rates. Manufacturer claims to 70% weight reduction in comparison to stainless steel, without impairing the pump's use in same applications.

(Al-alloy centrifugal pumps are product of J. C. Carter Company, 671 W. 17th St., Costa Mesa, Calif.)

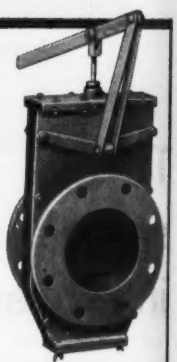
Check 5210 opposite last page.

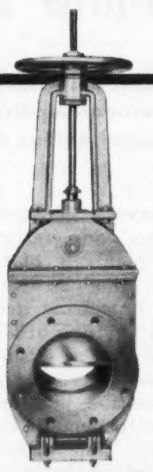
ROCKWELL SLIDE VALVES

for GASES SLURRIES OR FREE-FLOWING SOLIDS THAT CLOG OR JAM OTHER VALVES...

Standard Slide Valve, screwed end type or flanged (shown); when fully open, valve offers no restriction to fluid flow. Bulletin 500R.

"Kwikleen" Slide Valve—Not necessary to remove from line for cleaning. Sediment discharged at bottom. Complete cleanout by attaching steam, water or air line to plug hole in valve body. Bulletin 501R.





Heavy Duty "Kwikleen" Valve for line pressures to 60 psi. Blade not exposed when in fully open position. Ideal for pulp stock, slurries, dust, fly ash, scale, granular materials. Bulletin 508.

W. S. ROCKWELL CO.

2200 Eliot St., Fairfield, Conn.

Check 5211 opposite last page.

THAT'S INTERESTING

Al car-use boom seen

Automotive consumption of aluminum is expected to reach billion lb by 1965, according to George E. Herrman, manager of transportation sales for Aluminum Company of America. He foresees a myriad of chassis, body and engine uses. He also predicts motorists will take to air in transportairs by 1975.

In the lab 15.9 hr/wk

Chemists spend more time communicating than they do on research in the lab, according to studies by Case Institute of Technology researchists.

Average work week is broken up as follows: 16.5 hr in scientific communication; 6.7 hr in business communication; and 15.9 hr in other scientific work.

For more information on product at right, specify 5212 see information request blank opposite last page.

FALK and STEELFLEX are Registered Trademarks

Cut disconnect-reconnect time by as much as 50%

The FALK Spacer Coupling is specially designed for quick installation or removal *without disturbing the driving or driven unit.* This feature can save you up to 50% in disconnect-reconnect time when critical equipment—a process pump, for example—needs repair or replacement.

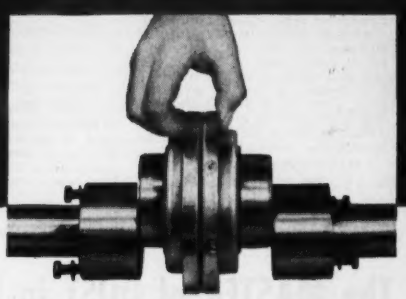
Here's another saving: with the FALK Spacer Coupling, you can quickly realign shafts *without the usual loss of operating temperature!*

And still another: you can remove or reinstall the FALK Spacer as a unit *without draining the lubricant.*

Because of its exclusive grid-groove Steelflex design, the FALK Spacer can accommodate residual misalignment—parallel, angular, or (most important) *both.* Also, it provides torsional resiliency that cushions shock and vibration. Thus it saves wear-and-tear on your connected equipment.

To prove these claims and enjoy these savings, install a FALK Spacer on one application—and see for yourself. Consult your FALK Representative or Authorized Distributor.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in many principal cities.

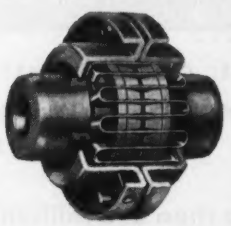


EASY AND QUICK TO INSTALL, DISCONNECT OR RECONNECT

First, mount shaft hubs to allow proper distance between hubs; then, align driving and driven units.

Second, compress Spacer to fit space between hubs and tighten cap screws to pull spacer hubs into the registered fit.

To disconnect, reverse the second step. No draining of lubricant necessary.



The heart of the FALK Spacer ...the basic Type F Steelflex
Write for Service Manual 4838

FALK
...a good name in industry

871C

Improved FEL-PRO C5-A "HI-TEMP" ANTI-SEIZE THREAD COMPOUND

delivers MORE dollar value at same LOW COST!

All These New Improvements—

NEW • Lower breaking and running torque
NEW • Non-settling, non-hardening, homogenized composition
NEW • Can be used in below freezing weather
NEW • Increased lubricating and sealing qualities
NEW • Prevents rust and corrosion

Now in tubes and cans

FREE TEST SAMPLE PROVES HOW!

You'll save countless man hours and avoid costly replacement of broken studs, bolts, etc., with the protective cushioning action provided by the colloidal copper composition of C5-A. Improved C5-A Lubricates and Seals for fast, easy application and removal. Gives same protective performance even after high-pressure, high-temperature use, up to 1800° F. Can be used on all metals and plastics.

✓ Ends seizing and galling even up to 1800° F.
✓ Reduces wrench torque
✓ Stops needless stud breakage
✓ Permits repeated re-use
✓ Speeds assembly and disassembly
✓ Prevents galling of stainless steel

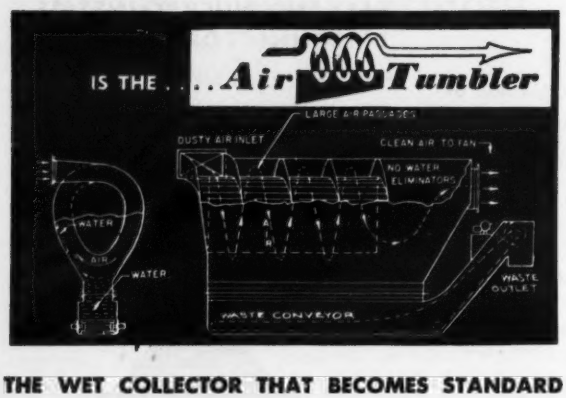
TRY C5-A NOW . . .

In chemical plants, you'll find C5-A used to protect hot pump studs, autoclaves, reactors, crackers, heat exchangers, etc. *Write for your free test sample today!*

FELT PRODUCTS MFG. CO.
Dept. 54, 7450 N. McCormick Blvd., Skokie, Illinois

Check 5213 opposite last page.

The MASTER of DUST in INDUSTRY



THE WET COLLECTOR THAT BECOMES STANDARD EQUIPMENT WHEREVER TRIED BECAUSE IT DOES A BETTER JOB AT LESS COST.

More than one million CFM in ONE plant

Write for Bulletin No. 601 Address

DUST SUPPRESSION & ENGINEERING CO.
P. O. BOX 67 • LAKE ORION, MICHIGAN

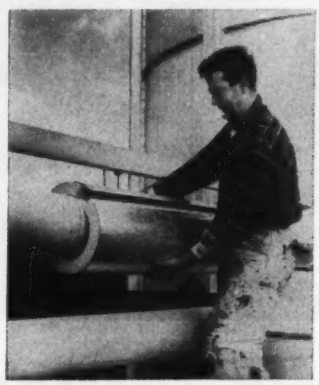
Check 5214 opposite last page.

Al jacket stands guard between pipe insulation and the elements

Insulation proves effective at temperatures to 1200°F

An embossed ripple-textured, protective aluminum jacket guards a newly developed pipe insulation.

Insulation is effective to 1200°F. Longitudinal seam of aluminum jacket snaps together with interlocking lips in one step. End joints are



Longitudinal seam of aluminum installation jacket snaps together with interlocking lips in one step

sealed with band containing integral sealing compound. This can be easily removed for inspection of pipe repairs by undoing joint strap and sealer bands and separating longitudinal seam.

Product is manufactured in pipe sizes of ½ to 24" IPS (in 1 to 3" thicknesses), and for copper tube of ½ to 3⅛" OD (in thicknesses of 1 and 1½").

(Kaylo Klad pipe insulation is product of Owens-Corning Fiberglas Corporation, 717 Fifth Ave., New York, N.Y.)

Check 5215 opposite last page.

Mobile rig at Mobil boosts pace of hydrostatic testing

An unusual mobil pump rig is being used by Mobil Oil Company to speed-up hydrostatic testing of valves and other equipment. The unit was built by the maintenance

the finest COATED FABRIC WORK GLOVE in the world

SURETY SILVERTEX

To handle those hot, tough jobs nothing equals Surety Silvertex Gloves for longer wear and lower cost. Superior Silvertex coating reflects heat and affords better protection against most industrial chemicals than rubber and standard synthetics. Their curved finger design and wing thumb construction cuts wear and gives greater comfort. And they won't crack or peel—remaining soft and pliable for the life of the glove.

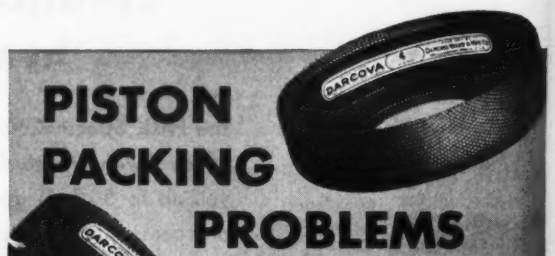
Available in gauntlet, knit wrist, band top and safety cuff styles, all in jumbo sizes and with or without ventilated backs. For a free test pair write on your letterhead, outlining your job requirements. We'll send them to you by return mail.

THE SURETY RUBBER COMPANY
CARROLLTON, OHIO

In Canada: Safety Supply Co., Toronto

Check 5216 opposite last page.

PISTON PACKING PROBLEMS SIMPLIFIED!



Conventional and 45° bevel type Pumcups.

• The *right* piston packing for reciprocating pumps and cylinders goes a long way toward eliminating the problems of slippage, maintenance and down-time.

Because Darcova Pumcups are made in a complete range of sizes, various types, and in many texture-engineered compositions, they *fit* your temperature-pressure-fluid conditions. That's one important reason why they usually outlast other packing at least 3 to 1 while holding top efficiency to the last!

Why not get *all* the facts? Send today for Bulletin No. 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 4, Pa.

DARCOVA
TRADE MARK
PUMCUPS

Check 5217 opposite last page.

staff of their East St. Louis refinery. It is used throughout refinery where water and air connections are available.

The hydrostatic-test unit incorporates horizontal air-operated hydro-pneumatic pump

Hydrostatic-test pressures, for spotting leaks and recalibration of relief-valve springs, are taken from mobile pump at Mobil Oil Company

with rated capacity of 7330 psi. This is mounted on rubber-tired cart. Pump supplies pressures of 250 to 2500 psi. It is operated by plant air at 90 psi.

Mobile unit is used primarily at turn-around time when refinery units are dismantled, inspected and restored to optimum working order. Many valves are inspected and rebuilt if necessary, and then tested for leaks under hydrostatic pressure. Also, relief valves are hydrostatically tested for correct operation.

In valve-repair shop, pump is connected to test stand on which valves are mounted. This permits maintenance staff to spot leaks instantly and also adjust relief-valve springs to precision settings for specific design pressures.

The test unit is also used for hydrostatic testing of heat exchangers prior to returning them to service. Without disturbing pipe arrangements, it quickly supplies hydrostatic pressure to meet Mobil's test specifications — such as holding 500 psi for ½ hour.

(Hydro-pneumatic pump is product of Aldrich Pump Co., Allentown, Pa.)

Check 5218 opposite last page.

RESERVED

FOR THE ENGINEER CONCERNED WITH DESIGNING SAFE, DURABLE, FLEXIBLE LINES

Send for your copy of
"FACTS YOU SHOULD KNOW ABOUT SWIVEL JOINTS"

CHIKSAN

Written by engineers and well illustrated, this file contains a wealth of useful information on the application of swivel joints in line design. You'll find facts and figures on torque, geometric characteristics, thrust and radial loads. There's information on how to approach design problems and a quick comparison between swivel joints and other flexible devices. And, you'll find a group of actual installation reports with diagramatic drawings showing how the swivel joints were applied in the system. Be sure you have a copy of "Facts you should know about Swivel Joints" in your possession. Write Chiksan for your file today.

CHIKSAN COMPANY, 300 North Brea Blvd., Brea, California
Please send me a copy of "Facts you should know about Swivel Joints."
NAME_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

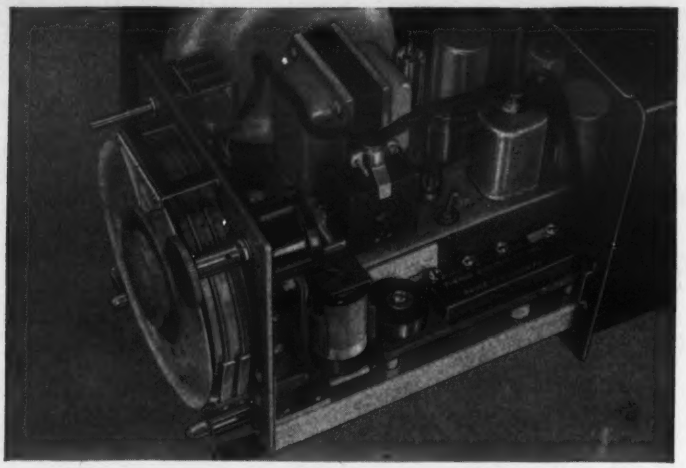
#60-53

fmc
A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY—Brea, California • Chicago 5, Ill. • Newark 2, N. J. • Divisions: Chiksan International, Hamer Valves, Weco • Subsidiary: Chiksan of Canada Ltd.

Check 5219 opposite last page.

Size makes the difference



Ultimate in convenience—all components accessible on slide-out chassis.

in the

Thermo Electronic® Signaling Controller

This new, rugged, compact off-on signaling controller is simply designed, using proven components, to give you maximum accuracy, sensitivity and speed of response, in a minimum of space.

Available as a potentiometer or bridge type unit. It will automatically, continuously, dependably provide two position control of any process you require, through the use of any DC signaling transducer. Corrective action follows almost instantaneously upon detection of even a 1 microvolt signal change.

Bright Red-Green lights on the panel door signal process condition. The instrument needs just 56 square inches of your panel space.

The Thermo Electronic Signaling Controller incorporates the new high-gain relay amplifier which combines high stability with exceptional sensitivity. Stability is ± 1 microvolt, power gain, 135 decibels. Full amplifier sensitivity is used for standardizing.

Tubes and parts are standard—obtained easily from any electronic parts outlet. The potentiometer circuit uses a flashlight battery as its power source. Front-set controls enable quick setting. Easily interchanged ranges, from 1-100 millivolts, adapt to an exceptionally wide range of sensing elements. Fail-safe action protects expensive process equipment against transducer, component or power failure.

15.8" scale has large, easy-to-read numerals.

Solve your two-position control problems quickly and better with Thermo Electronic Instruments.

Write today for Catalog 51-5

Thermo Electric CO., INC. SADDLE BROOK, NEW JERSEY

In Canada: THERMO ELECTRIC (Canada) LTD., Brampton, Ontario

Check 5220 opposite last page.

SAFETY SLANTS

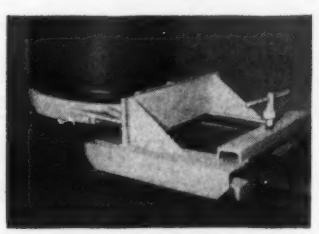
Color change=leak

. . . of gas or liquid in amounts of as little as 0.01 cc/hr, on adhesive-backed tape bearing indicators which turn a stated contrasting color on exposure to specific gas or liquid.

Tape is available for detection of anhydrous ammonia, chlorine, hydrogen, hydraulic fluids, acid fumes and many other gases and fluids. It may be obtained in wrap-around style for system connections and in surface-mounting type for indication of random gas leakage.

(Tech-Tape leak indicators are product of Pyrodyne, Inc., 11973 San Vicente Blvd., Los Angeles 49, Calif.)

Check 5221 opposite last page.



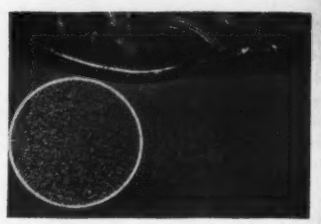
Drum-handling injuries

. . . can be avoided by use of 55-gal steel-drum handler which mounts on fork or apron of any make or model of lift truck and most makes of walkie and straddle trucks.

One man can mount mechanical drum arms on truck. They automatically pick up drums in vertical position without operator leaving his seat. Arms are of all welded construction and take up a few inches more space in width than drums.

(Vert-O-Matic drum handlers are product of Little Giant Products Inc., 1530-50 N.E. Adams St., Peoria, Ill.)

Check 5222 opposite last page.



End personal downtime

. . . from injuries sustained from slipping on wet floors, by use of abrasive floor coating. Compound is heavy bodied plastic with wear-resisting mineral-type aggregate. It is designed for troweling over metal, wood, concrete or mastic to form nonslip coating.

Coating can be troweled over any clean, dry solid floor surface. Material sets hard enough for foot traffic in 12 hours, truck traffic in 24 hr. No primer, sealer or etching is required—even when applied on polished-metal surfaces. Compound is available in 1-, 5- and 55-gal amounts.

(Abrasive overlay floor coating is product of Paramount Industrial Products Co., 2717 E. 75th St., Cleveland 4, O.)

Check 5223 opposite last page.

Ammonium-nitrate transporter body has built-in mixer which pre-measures and adds explosive oil to nitrate as body is unloaded. Unit is specified in Bul A-438—Baughman Manufacturing Co.

Check 5224 opposite last page.

Tortuous pipe windings on pump intake side eased by filter shapes

Series of filter-body shapes have been designed to simplify intake pipe to suction side of pumps. Multiplicity of bends and turns on suction side of pump can result in so much pressure drop in intake line that pump has little or no capacity left to cope with filter. These shapes are designed to eliminate excessive bends.

Body shapes can often be installed on existing pump unit entirely without use of elbows.

These filter body shapes are designed to simplify intake pipe to suction side of pump

This means pressure-drop capacity of pump can be used to tolerate dirt in filter instead of being completely used up in lifting fluid to pump.

Supercharging can often also be eliminated without danger of cavitating pump due to reduced suction-line pressure-drop. Shapes available now include bottom inlets, side inlets and side outlets. All body shapes have characteristic sliding cartridge and external dirt indicator. All can be equipped with electric limit switch to indicate filter clogging.

(In-line filters are product of The Rosaen Company, 1776 E. Nine Mile Rd., Hazel Park, Mich.)

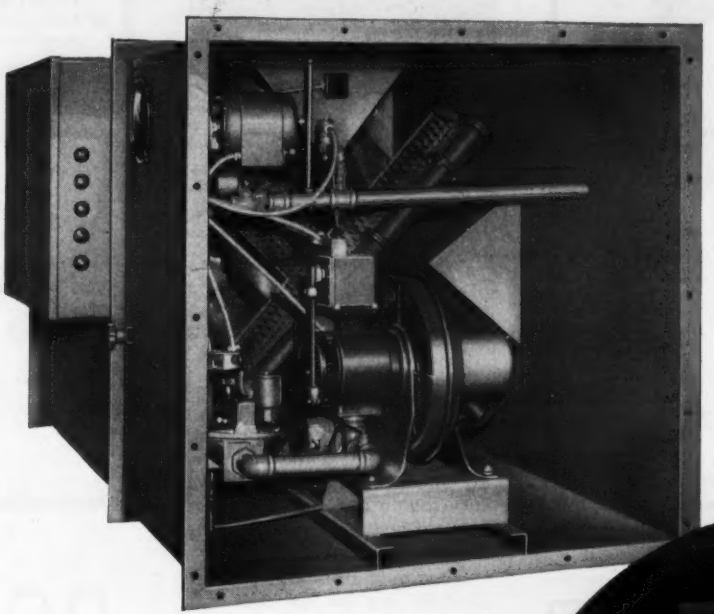
Check 5225 opposite last page.

Concrete cracks sealed quickly on-the-spot

Uses: Sealing cracks and expansion joints in concrete and black-top surfaces.

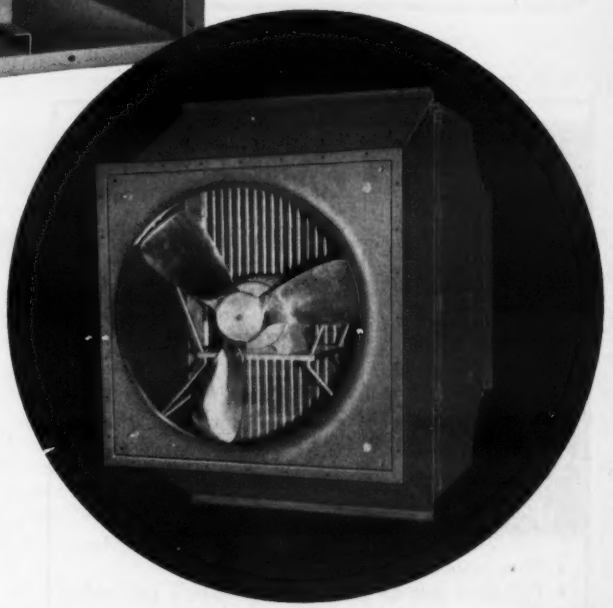
Features: Seal furnishes elastic filler and surface sealer that cannot be distributed by mild shifting of pavement and

Hartzell intake air units are custom engineered to your make-up air requirements



Hartzell Gas-Fired Air Intake Unit — available in capacities from 15,000 to 90,000 C.F.M., from 1,000,000 to 7,000,000 B.T.U.

Hartzell Steam-Fired Air Intake Unit — available in capacities from 4,000 to 36,000 C.F.M. Vertical discharge models with roof ventilator type fan housing also available.



You write the specifications for the air intake equipment that meets your exact needs — and Hartzell will supply it. Hartzell intake units are assembled to your order from standard components. You get, and pay for, only the elements you need. Direct gas-fired heat unit or steam coil — filter house and filters — shutters — outlet diffusers . . . all can be included if you need them, omitted if you don't. Fans and control systems for all operating requirements are readily available.

For complete details on the industry's most complete, most versatile line of air intake equipment, call your nearby Hartzell field office or write for Bulletin A-117.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.

HARTZELL PROPELLER FAN COMPANY
Div. of Castle Hills Corp. A Member of AMCA

65 Thomas Blvd. Piqua, Ohio
Engineering Offices in Principal Cities

Check 5226 opposite last page.

SPRAY NOZZLES

greater choice of patterns

Full Cone

Hollow Cone

Square Spray

Flat Spray

greater choice of capacities

greater choice of materials and spray nozzle types

WhirlJet hollow cone spray

FullJet full cone spray

Pneumatic Atomizing Nozzle

FlatJet flat spray

Over 12,000 Standard Spray Nozzles for more exact performance to fit your needs

For complete information write for Catalog No. 24

SPRAYING SYSTEMS CO.
3216 Randolph Street • Bellwood, Illinois

Check 5227 opposite last page.

walks, due to expansion and contraction.

Description: Developed from ductile grades of asphalt, inert-mineral fillers add stability and pour and penetrate as

Concrete seal fills cracks and expansion joints

readily as water. They prevent entrance of dust, air and water. After setting, seal will not run due to hot baking sun or become brittle in cold freezing temperatures.

Ready-to-use emulsified product can be applied with speed and facility. By placing material in cone-shaped container, it can be poured in crack with minimum of labor and expense. No heating is required.

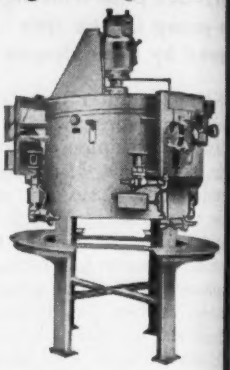
(Concrete seal is product of The Monroe Company, Inc., 10703 Quebec Ave., Cleveland 6, Ohio.)

Check 5229 opposite last page.

KETTLES AND JACKETS

***Faster* Heating and Cooling . . . *Longer* Life**

- 5 Gallon to 325 Gallon Capacity Kettles for Waxes, Oils, Resins, Salts, Asphalts.
- TRENT "Folded-and-Formed" Heating Elements in Metal Inner Liner.
- Complete Temperature Control to Prevent Overheating, Scorching, Hot Spotting.
- Jackets for Retorts, Reactors and Autoclaves.



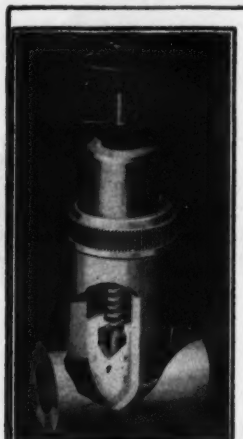
- High Temperature Uniformity to 2000°F.
- Compact, Space Saving Design.
- Low Thermal Inertia—High Dielectrical Strength (600V).
- Economical Installation and Maintenance.

WRITE FOR BULLETIN 72-TE

TRENT INC.

Electrically Heated Industrial Equipment
235 LEVERINGTON AVE., PHILADELPHIA 27, PA.
In Canada Supreme Power Supplies Limited, Toronto 14

Check 5230 opposite last page.



CORROSION-RESISTANT THROTTLABLE PLASTIC GATE VALVES

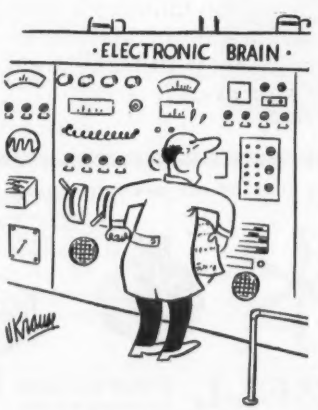
- Available in: Penton, PVC and Styrene-Copolymer
- Non-contaminating and non-galling
- Full flow and no pressure drop—like a gate valve
- Throttling control—like a globe valve
- Socket-weld—screwed and flanged ends—½" to 2" sizes—rated for 150 lbs.

Write for Catalog #42A

Vanton PUMP & EQUIPMENT CORP.

DIVISION OF COOPER ALLOY CORP., HILLSIDE, N. J.

Check 5228 opposite last page.



"Keep it simple!"

MCC the acid tamer

a GIANT STEP FORWARD for ACID CLEANING and PICKLING

ALUMINUM BOLTS immersed in identical acid strength for 24 hours. Solution using MCC inhibitor showed no visible effects.

NOW ALUMINUM or galvanized can be cleaned by the hydrochloric solution method, without any harmful corrosive effect.

MCC acid corrosion inhibitor, a NEW universal additive for all acids, except nitric, improves acid cleaning solutions for all metals except magnesium, by inhibiting the surface destroying corrosive effect of the acid without imparing the cleaning qualities. MCC the universal additive is a giant stride forward in acid cleaning techniques.

WRITE FOR BULLETIN No. 100

devlimco

DEVELOPMENTS UNLIMITED INCORPORATED
328 BROADWAY PASSAIC, NEW JERSEY

Check 5231 opposite last page.

NEW LITERATURE
Plant Engineering
Maintenance & Safety

Cold-drawn steel tube and welded type are reviewed in 20-page catalog containing tabular data on chemical composition, physical and mechanical properties and tolerances of tube. Cat 60—Pacific Tube Company.

Check 5232 opposite last page.

Plastic extrusions are subject of articles in 72-page catalog covering design and application of extrusions, and including up-to-date property tables, short descriptions of materials and over 700 cross-sectional diagrams of extruded moldings. Copies of Extruded Plastics Cat can be obtained by letterhead request from Anchor Plastics Company, Inc., 36-36 36th St., Long Island City 6, N. Y.

Electronic components, including data on resistors, diodes and controls, are detailed in 48-page catalog which pictures and specifies various units. Replacement Parts Cat—Distributor Division, International Resistance Co.

Check 5233 opposite last page.

Welding of aluminum and aluminum-alloy pipe is taken up in 40-page booklet covering in condensed form all phases of aluminum-pipe welding — from processes and machine settings to welding techniques and heat treatment. Copies are available at $2.00 each from Dept. T, The American Welding Society, 33 W. 39th St., New York 18, N. Y.

Magnetic particle clutches, in capacities of 0.156 to 1900 lb-in, are covered in 16-page bulletin which includes curves, installation drawings and other illustrations to demonstrate features and possible uses of 10 different series of clutches. Magnetic Particle Clutches Bul—Electro-Mechanical Division, Lear, Incorporated.

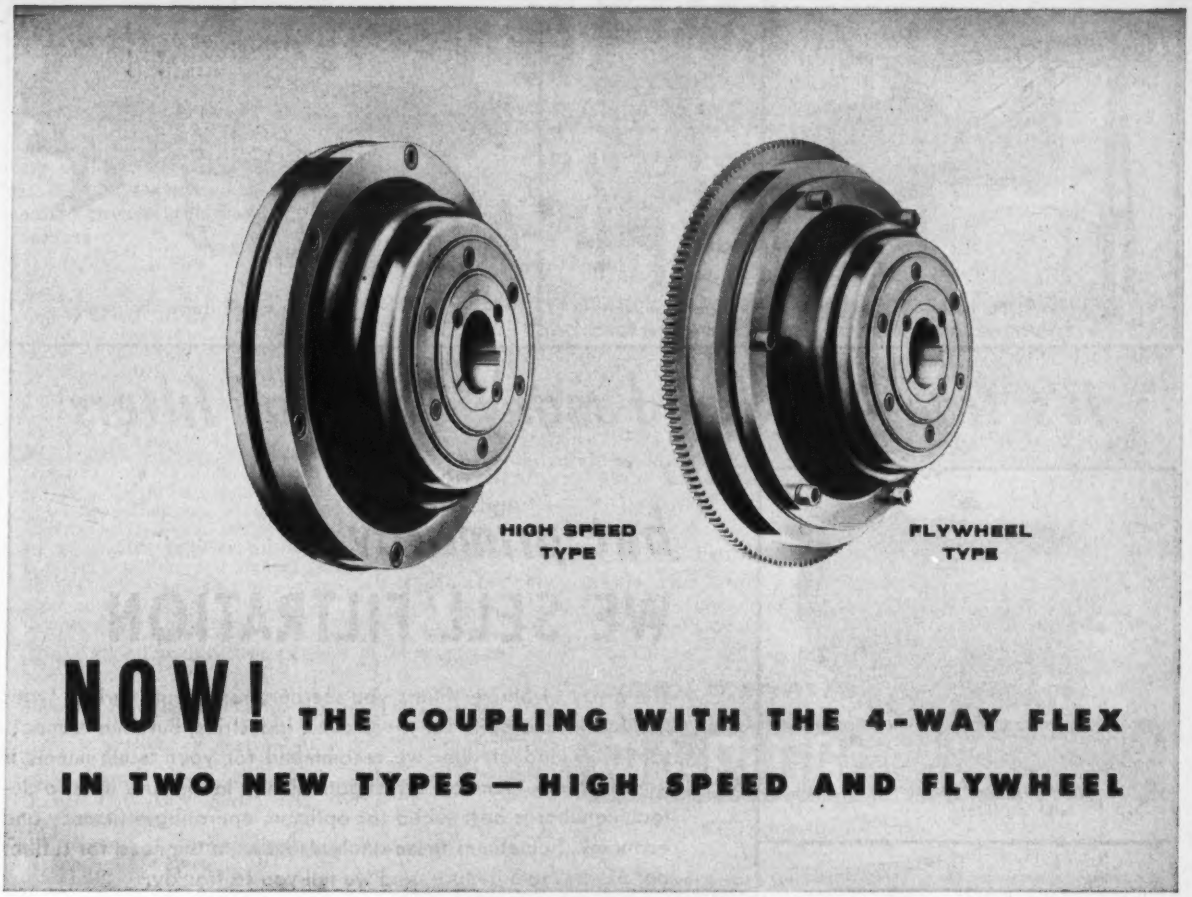
Check 5234 opposite last page.

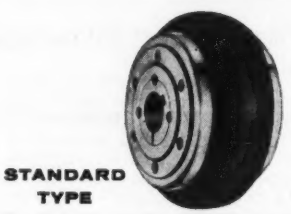
Progressing-cavity pump is subject of 20-page catalog including, in addition to specification tables and various photographs and drawings illustrating principle of operation, two-page application-data table outlining castings, rotor and stator materials for handling various fluids. Bul 100—Moyno Pump Division, Robbins & Myers, Inc.

Check 5235 opposite last page.

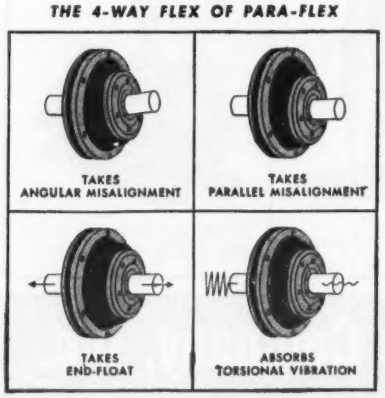
Twin-electrode carbon-arc welding is topic of discussion in 12-page Carbon-arc Welding Manual—The Arcair Company.

Check 5236 opposite last page.





THE 4-WAY FLEX OF PARA-FLEX



DODGE Para-flex

Industry asked for this—and here it is! Dodge Para-flex, the unique coupling that swallows up misalignment, is now available for high speed applications, and for high torque at either high or low speed.

The new Dodge High Speed Para-flex is specially designed for operation with motors and internal combustion engines that turn up to 5230 rpm.

The new Flywheel Para-flex, with the same capabilities, has a flexing element that bolts directly to the flywheel of internal combustion engines.

Like the Standard Type (with capacities up to 2000 hp at 1080 rpm) these new Para-flex Couplings feature a modern, tire-like flexing element that handles angular and parallel misalignment, end-float (or any combination) and absorbs torsional vibration. The amazing performance of Para-flex Couplings is a matter of record in thousands of installations.

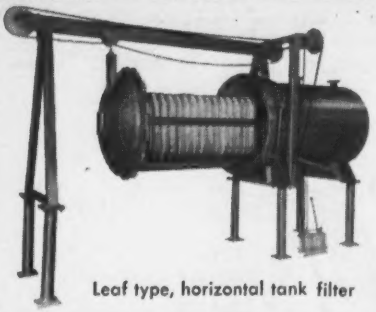
Ask your Dodge Distributor—or write us for new technical bulletin.

DODGE MANUFACTURING CORPORATION
6200 Union Street, Mishawaka, Indiana

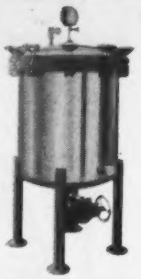
DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the *white* pages of your telephone directory, or in the yellow pages under "Power Transmission Equipment."

Check 5237 opposite last page.



Leaf type, horizontal tank filter



Leaf type, vertical tank filter

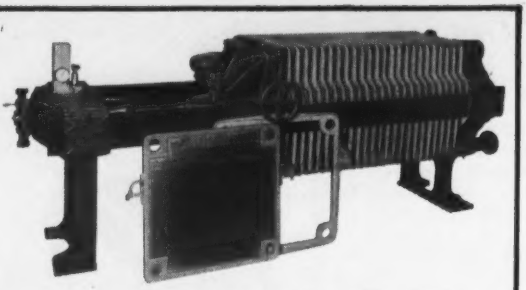
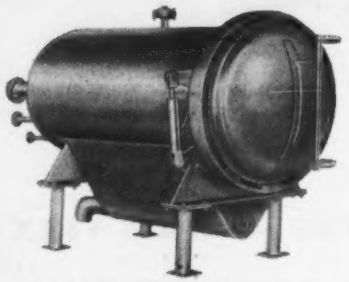
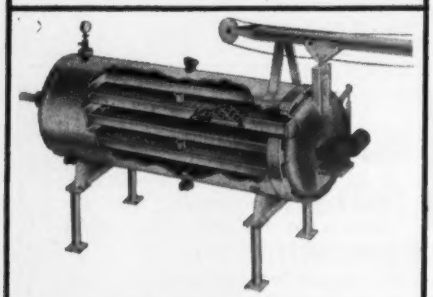


Plate and frame filter press

It's true—we build many types of filters



Rotary leaf type positive sluicing filter



Horizontal tray filter

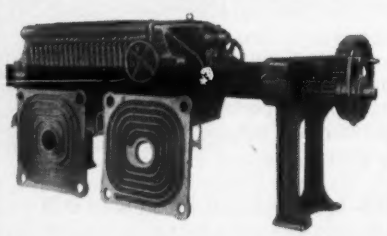
but primarily
WE SELL FILTRATION

The array of Shriver filters you see here represents various types we design and build for the process industries. But—more important—the kind of filter we recommend for your requirements is based on our technical investigations and laboratory tests to determine what is best suited for optimum operating efficiency and economy. Sometimes these analyses indicate the need for a filter not of our manufacture, and we tell you so frankly.

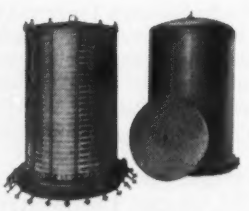
Such unbiased evaluations have helped build good will which our long experience has maintained at a high level.

That is why at Shriver's we try to "sell filtration," and the right filter for your process readily sells itself.

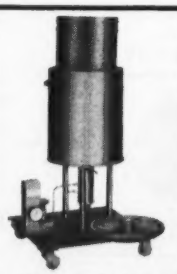
Let us work with you on your filtration improvement or expansion programs.



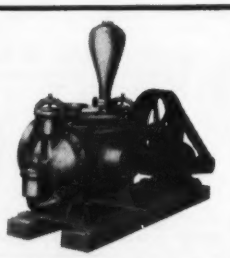
Continuous plate and frame slurry thickener and washer



Horizontal plate filter with hood type cover



Horizontal plate, tank type filter



Diaphragm pump for abrasive, corrosive materials

FILTERS AND COMPLETE FILTER STATIONS TO MEET YOUR EXACT PROCESSING NEEDS

T. Shriver & Company, Inc.

846 HAMILTON STREET • HARRISON, N. J.

Sales offices in principal cities

Check 5238 opposite last page.

ENGINEERING & SAFETY

Shelves for variety of applications in plants and storerooms are made of phosphatized steel. They are pictured in 34-page Cat 2400—Penco Div., Alan Wood Steel Co.

Check 5239 opposite last page.

Plastic welding is topic of 56-page instruction book. Book includes more than 100 illustrations and practical information and procedures being practiced most successfully today in field and shop, in addition to many "tricks of the trade." Copies of book which contains no advertising are available at $1.00 each from Laramy Products Co., Beechwood Street at Route 3A, Cohasset, Mass.

Variable-speed drives of stepless type for fractional-hp applications are reviewed in 16-page catalog which includes full page of installation suggestions illustrated by diagrams. Cat ZM-400C560—The Zero-Max Company.

Check 5240 opposite last page.

Gears and speed reducers are delineated in 246-page catalog containing information on sizes, ratings, and specifications of complete line. Also included are engineering data on proper selection of gears and reducers to meet specific job requirements. Copies of Gear and Speed Reducers Cat may be obtained by letterhead request from The Ohio Gear Company, 1333 E. 179th Street, Cleveland 10, Ohio.

Cooling-tower-life extension is topic of discussion of single-page data sheet reviewing how deterioration of cooling-tower wood by chemical, biological and physical factors shortens life of cooling towers. "How To Extend Cooling Tower Life"—Betz Laboratories, Inc.

Check 5241 opposite last page.

Metal-clad switchgear is expanded upon in 20-page Bul 2801-2A—I-T-E Circuit Breaker Company.

Check 5242 opposite last page.

Rotating-shaft seals are specified in 32-page catalog, including complete specifications of line. Cat 660—Cartriseal Corporation.

Check 5243 opposite last page.

Grout-failure avoidance is subject of 16-page catalog describing successful grouting techniques and illustrating methods of grouting different types of equipment, mixing and placing of grout, and cold- and hot-weather grouting. Information on recommended mixes and estimating tables are also included in Bul E-1d—The Master Builders Company.

Check 5244 opposite last page.

manufacturers' current literature

This section features a variety of literature currently available from manufacturers. See also the other sections in this issue for new literature pertaining to those particular sections

Fluids Handling

Progressing-cavity pumps may be obtained in capacities to 500 gpm for pressures to 1000 psi. They are specified in Bul 40 CP—Robbins & Myers, Inc.

Check 5245 opposite last page.

Single steam trap is good for all pressures in 10- to 600-psi range. It is subject of Steam Trap TD-50 Bul—Sarco Company, Inc.

Check 5246 opposite last page.

Pipe-fabrication standards for wide range of applications are available from Pipe Fabrication Institute.

Check 5247 opposite last page.

Rubber hose is specified in bulletin available from Manhattan Rubber Div., Raybestos-Manhattan, Inc.

Check 5248 opposite last page.

Double-sealed-type screwed-end, ¼ to 3" ball valves; screwed, flanged or weld-end, ¼ to 2" PVC ball valves; flanged, ½ to 10" ball valves; remote cylinder operators; electric-motor operators; PVC flanged-end 3 and 4" ball valves; and ¼ to 2" high-pressure ball valves are specified in Data Sheets 1 to 8, respectively—Jamesbury Corp.

Check 5249 opposite last page.

Vertical pumps and horizontal models are specified respectively in Buls V-837 and C-355—Taber Pump Co.

Check 5250 opposite last page.

Tube-fittings line includes complete selection of shapes for 1/16 through 1" OD tube. No special preparation of tube is required to use fittings, which are covered in Swagelok Bul—Crawford Fitting Company.

Check 5251 opposite last page.

Gear-operation valve switch is made easily with standard and universal operator, readily mounted on manufacturer's iron and steel gate valves of sizes 6 to 36", in outside screw and yoke or non-rising stem patterns. No special yoke castings or brackets are needed, just basic gear operator and two-piece adapter. Unit is detailed in Converto-Gear Operator Bul — Industrial Products Group, Crane Company.

Check 5252 opposite last page.

Ball valves can be compression-mounted between flanges of present pipe system with minimum of downtime. They are available in stainless steel in size range of ½ to 6". Tested to 1000-psi (cold non-shock service) and 300 psi (at 400°F), valves are one ball-valve type covered in Cat BVFA — Cooper Alloy Corporation.

Check 5253 opposite last page.

Stainless pipe unions have fully confined Teflon seals. Units are made in pressure ratings of 2000, 3000, 4000 and 6000 psi. They are cataloged in Koncentrik Unions Cat—The Special Screw Products Company.

Check 5254 opposite last page.

Pump cups for reciprocating pumps and cylinders are reviewed in Bul 5903—Darling Valve & Manufacturing Co.

Check 5255 opposite last page.

Full-cone free-flow nozzles are designed for high-capacity low-pressure installations where clogging is problem and full-cone spray a necessity. These are one type covered in the catalog, "Spraco Nozzels"—Spray Engineering Co.

Check 5256 opposite last page.

Rotary pumps have capacities of 1 to 2000 gpm and viscosities of 32 to one-million SSU; they discharge to 1000 psi for viscous liquids and 200 psi for water and light oils. Line is explained in Rotary Pumps Bul — Sier-Bath Gear & Pump Co., Inc.

Check 5257 opposite last page.

Steam-trap selection and installation comes up for discussion in 44-page Steam Trap Book—Armstrong Machine Works.

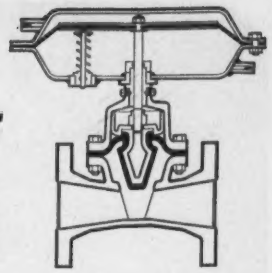
Check 5258 opposite last page.

Impulse steam traps, with renewable seats and discs that can be replaced without removing from line, are listed in Steam Traps Cat —Yarnall-Waring Company.

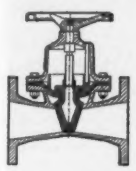
Check 5259 opposite last page.

NEW!

CORROSION RESISTANT PACKLESS DIA-PLUG VALVES



- Available in aluminum, stainless steel, lined cast iron, etc.; sizes ⅜" to 10".
- Reduces valve costs and provides extra safety.
- Self draining even on horizontal line.
- Maintenance cut to minimum. Working parts and plug can be replaced on the line.
- Assures positive closure even if diaphragm segment of the Dia-Plug should rupture due to excessive pressure or misuse.
- Offers excellent throttling characteristics.
- Requires less force to close allowing for use of small and more economical operators, or minimum manual effort.



WRITE FOR COMPLETE DETAILS AND CATALOG.

DIA-PLUG Division of Cryogenics Corporation
500 Terrace St., Meadville, Penna.

Check 5260 opposite last page.

WE WEAVE ACCURATE "WORKING OPENINGS"

IN WOVEN WIRE SCREEN AND WIRE CLOTH PRODUCTS

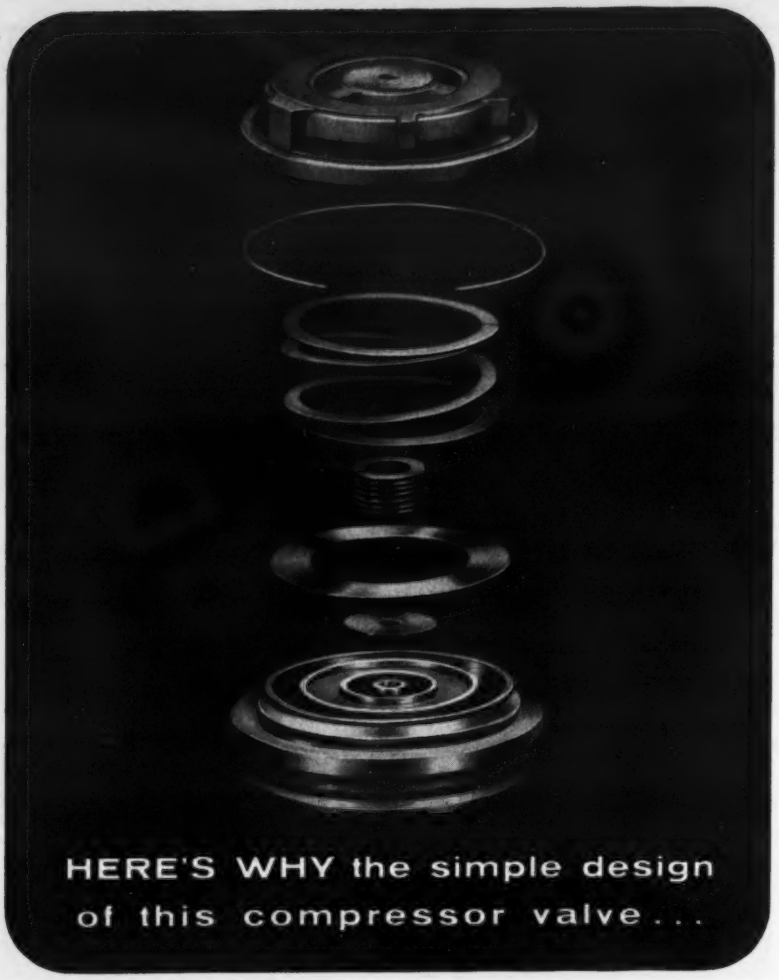
Whether you are grinding, sizing, scalping, dewatering or filtering it's the accuracy of the "working opening" that makes the difference in woven wire screen and wire cloth products. We pride ourselves in weaving accurate "working openings", an engineered screening surface to meet your specification.

First, the best metal or alloy is selected—hard enough to withstand the abrasive action—ductile enough not to break under stress. Next, the best wire diameter and crimp are determined. Then we weave wire screen or wire cloth around accurate "working openings" best suited for your screening application.

FREE! Write for bulletin 160 giving complete details and facilities.

THE CLEVELAND WIRE CLOTH & MFG. CO.
3577 EAST 78th STREET • CLEVELAND 5, OHIO

Check 5261 opposite last page.



makes PENNSYLVANIA COMPRESSORS run efficiently...silently...with minimum maintenance.

Stainless steel valve discs lift against a cushion of air in the simple, efficient design of the Air Cushion Valve that makes PENNSYLVANIA Compressors run so silently, so dependably, and with such low maintenance requirements. Air Cushion Valves have no nuts, bolts, or screws to break or burn fast. You get longer valve life . . . eliminate wear . . . eliminate noise caused by metal striking metal. Flat valve discs have no flexing or bending action to weaken or distort them. And the valve springs are highest grade stainless steel, rolled on edge, insuring maximum strength and durability. There is just one spring for each disc, and it bears evenly on the entire surface.

But this is only part of the PENNSYLVANIA story. Learn all the facts in "Compressors for Industry". It describes PENNSYLVANIA Compressors from 10 to 350 hp, horizontal, angle, and OILFRE models. Write to Dept. B-8 for your copy today.

PENNSYLVANIA
PUMP AND COMPRESSOR COMPANY
Easton, Pa. • Earning Customer Confidence Since 1920

Check 5262 opposite last page.

Safety

Synthetic chemicals to help protect against extreme loss by fire or explosion — including fire-resistant lubricants and hydraulic fluids, fire-resistant plasticizers, and fire-retardant additives for paints and varnishes — are covered in Fire-resistant Chemicals Bul — Celanese Chemical Company, Div. of Celanese Corporation of America.

Check 5263 opposite last page.

Explosion-proof CES-CESD receptacle and matching plug incorporates pressure-type solderless receptacle connectors and plug-locking slide mechanism. Product is previewed in Bul CES 660—Appleton Electric Company.

Check 5264 opposite last page.

Discharging foul air or fumes is job of ventilator-blowers tabulated in bulletin available from Coppus Engineering Corp.

Check 5265 opposite last page.

Conveying

Conveyor-belt carriers have roller brackets tilted 2° in direction of travel. They are expanded upon in Bul 355—Standard Products Division, Stephens-Adamson Mfg. Co.

Check 5266 opposite last page.

Belt conveyors, which are available in pre-built sections, are tabulated in 40-page Pre-Bilt Cat 2779 —Link-Belt Company.

Check 5267 opposite last page.

Closed-belt-conveyor-elevators (zipper type) are presented in Bul 349 —Engineering Division, Stephens-Adamson Mfg. Co.

Check 5268 opposite last page.

Tubular conveyors, which are self-cleaning and self-supporting, are subject of Fact-Finding Report — Conveyor Division, Hapman Corporation.

Check 5269 opposite last page.

NEXT MONTH

Propylene imine is now available in commercial quantities. This compound, containing a highly reactive three-membered ring, will be described in the November issue.

Chemical Materials

Silicone defoamers are reviewed in Foam Control Manual—Dow Corning Corporation.

Check 5270 opposite last page.

Metal treatments and etchings are covered in six bulletins. Surface treatment of metals with peroxygen compounds (39 and 51), improving properties of copper and brass surfaces (86), paddle etching of printed circuits with ammonium persulfate (97), tank-immersion etching of printed circuits with ammonium persulfate (99), and etching of printed circuits with mercury activated persulfate (102) . . . are taken-up in Buls 39, 51, 86, 97, 99 and 102—Becco Chemical Division, Food Machinery & Chemical Corporation.

Check 5271 opposite last page.

Phosphorus pentasulfide, phosphorus sesquisulfide, muriatic acid and sulfuryl chloride are subjects of four Data Sheets available from Hooker Chemical Corporation.

Check 5272 opposite last page.

Hydrogen-peroxide-handling problems can be solved by means of service described in Four-fold Engineering Service Bul—Becco Chemical Division, Food Machinery & Chemical Corporation.

Check 5273 opposite last page.

2-Nitropropane has strong solvent power for many materials including a number of natural resins, synthetic resins, coating materials, dyes, organic chemicals, and fats and oils. Properties and applications are outlined in 2-Nitropropane Bul—Industrial Chemicals Department, Commercial Solvents Corporation.

Check 5274 opposite last page.

Silicone additives' role in the chemical-processing industries is pointed out in brochure, "How Silicones Work for the CPI" — Dow Corning Corporation.

Check 5275 opposite last page.

Anionic surfactants are made in two types. One is employed especially in industrial applications requiring stability to alkali. Second is used principally in detergents for dishes and light laundry, and in household cleaners for rugs and hard, waxed surfaces. Information on these is incorporated in Aliphat CO-433 and CO-436 Buls, respectively — Antara Chemicals, Sales Division of General Aniline & Film Corporation.

Check 5276 opposite last page.

Peroxygen chemicals are discussed in bulletin available from Becco Chemical Division, Food Machinery & Chemical Corporation.

Check 5277 opposite last page.

Fatty acids and derivatives — including distilled fatty acids, nitrogen derivatives, glyceryl esters, alcohol esters, and glycol and polyglycol esters — are covered by Wilmar Fatty Acids Data Sheet — Wilson-Martin, Division of Wilson & Co., Inc.

Check 5278 opposite last page.

Polyvinylidene chloride (water-dispersed) has moisture-vapor transmission 2½- to 5-times lower than that of polyethylene. It can be coated on paper, paperboard, plastic and other substrates. Full story on this material is outlined in Resyn 3600 Bul — National Starch and Chemical Corporation.

Check 5279 opposite last page.

Dodecenylsuccinic anhydride finds uses as epoxy curing agent, polyester and alkyd resin intermediate, corrosion inhibitor, etc. These and many other uses are cited in a six-page technical bulletin. It gives properties, principal reactions, infrared absorption spectrogram, viscosity curve, suggested uses and bibliography. Tech Bul I-8 — National Aniline Division, Allied Chemical Corporation.

Check 5280 opposite last page.

Silicone antifoams are available in two types: emulsion for aqueous systems and fluid for non-aqueous systems. Data on both are incorporated in SAG Silicone Antifoams Bul — Silicones Division, Union Carbide Corporation.

Check 5281 opposite last page.

Drying and Heating

Fired air heaters may be operated on oil or gas to produce temperatures to 1900°F, flows to 500 lb/sec and pressures to 5000 psig. They are subject of Fired Air Heaters Bul — Thermal Research & Engineering Corp.

Check 5282 opposite last page.

Rotary kilns are available in optimum (via IBM computer) designs for lime, dolomite and magnesite burning; cement, wet or dry process; ore nodulizing; and coke calcining. Line is discussed in Rotary Kilns Bul — Kennedy Van Saun Manufacturing & Engineering Corporation.

Check 5283 opposite last page.

Pressure-atomizing burner of packaged type is engineered and approved by Underwriters' Laboratories for use with No. 4 and 5 commercial fuel oils. Specified in Pressure-atomizing Burner Bul—National Airoil Burner Co., Inc.

Check 5284 opposite last page.

Protective-atmosphere heating with silicone-carbide heating elements is one of topics covered in general coverage of such units in Bul H — Globar Plant, Refractories Division, Carborundum Co.

Check 5285 opposite last page.

Electric dryers' role with gases is outlined in Gas-drying Data Sheets —Pittsburgh Lectrodryer Division, McGraw-Edison Company.

Check 5286 opposite last page.

Electric fluid-heat-transfer systems are produced in ten different models and two cabinet sizes. They range in output from 15,350 to 272,000 Btu. Systems are detailed in Heat-transfer Systems Bul — Radcor, Inc., Subsidiary of Edwin L. Wiegand Company.

Check 5287 opposite last page.

Dryers, utilizing construction principle permitting prefabricated unit with trussed-and-tensioned insulated panels, are considered in Drying Equipment Bul—The National Drying Machinery Co.

Check 5288 opposite last page.

Packaging

Tanks of all types—open or enclosed, for process or storage, lined or unlined—are covered in Bul F-3—The Kirk & Blum Manufacturing Company.

Check 5289 opposite last page.

Fifty-five gal drums are made of stainless, Monel, Inconel or nickel. They are specified in Stainless-steel Drums Cat—Pressed Steel Tank Company.

Check 5290 opposite last page.

Squat jars can be ordered from stock in nine sizes, in clear polystyrene or linear polyethylene. Available in wide range of colors, they are tabulated in Squat Jars Cat—Celluplastic Corporation.

Check 5291 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

Young . . .

Heat Transfer Specialists to the

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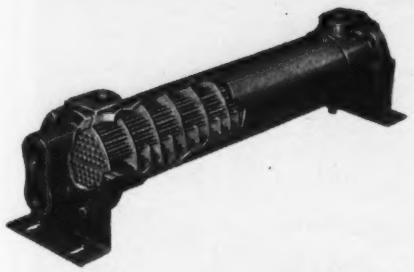
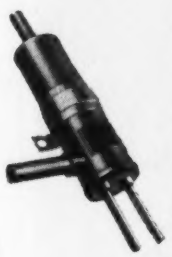
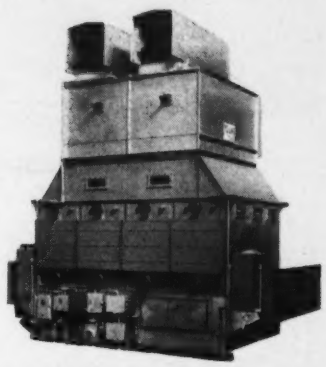


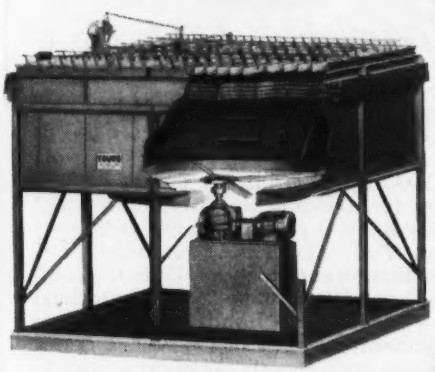
HEAT EXCHANGERS — Including stainless steel, specially designed for the chemical processing industry. Single and multi-pass. Up to 300 psi test pressure on tube side. Standard sizes for quick delivery. Catalog 1258-A.



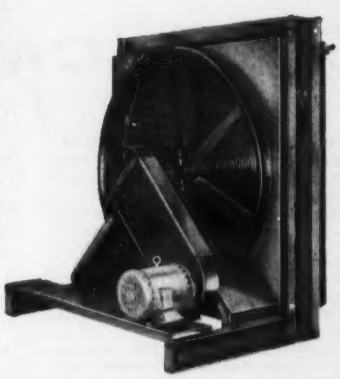
STAINLESS STEEL SAMPLE FLUID COOLERS — Designed to reduce sample fluid temperatures from 600F to 100F, at pressures up to 1,500 psi. For control testing pilot plants, boiler water samples, chemical, high temperature and pressure process fluids. Catalog 2058.



EVAPORATIVE COOLERS AND CONDENSERS — Available in 8 models with up to four coil assemblies. Sectionally built. Handles up to 2000 psig for steam or natural gas cooling. Catalog 1959.



HORIZONTAL CORE HC® COOLERS — Used for cooling gases, oil and water; condensing steam and vapors. Closed circuit system permits water conservation. Articulated installations offer unlimited cooling capacities. Catalog 557.



ENGINE JACKET WATER COOLERS — Single or combination of jacket water and lube oil. Wide size range with capacities from 210,000 to 3,000,000 Btuh. Catalog 1356.

Young *ideas for solving heat transfer problems are GOOD IDEAS*

YOUNG RADIATOR COMPANY DEPT. K-370 RACINE, WISCONSIN

PLANTS AT RACINE, WISCONSIN AND MATTOON, ILLINOIS

Check 5292 opposite last page.

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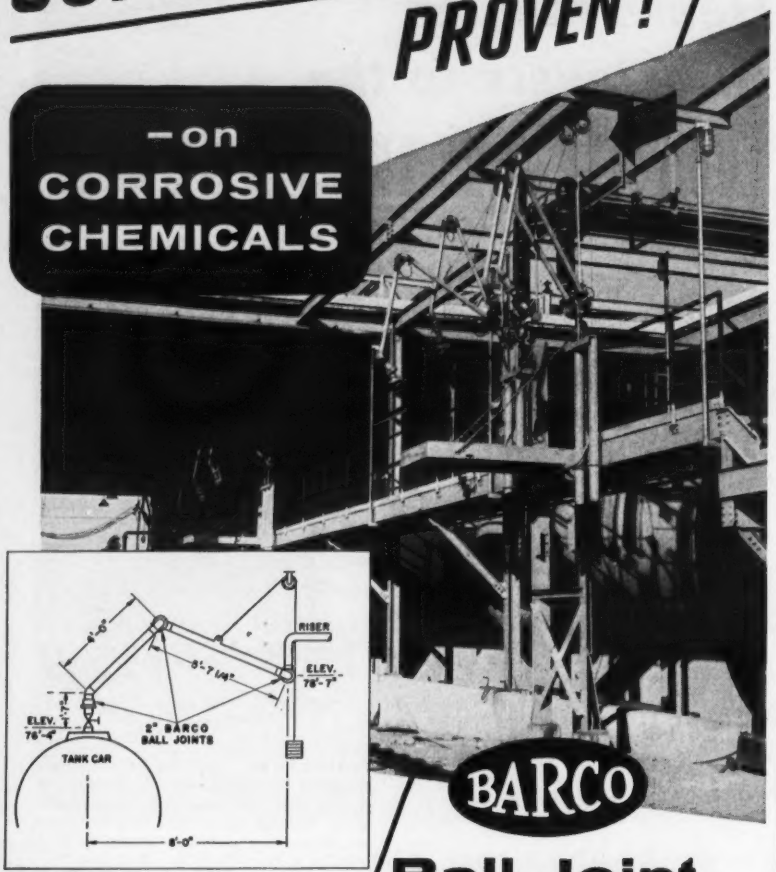
—on CORROSIVE CHEMICALS



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HERE'S WHY:

- **NO METAL-TO-METAL CONTACT BETWEEN MOVING PARTS**—No ball bearings in joints to corrode, etch, or "freeze."
- **CHEMICALLY INERT SEALS**—No. 110CT (reinforced Teflon) gaskets for corrosive service. Suitable for most chemicals.
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- **SUPERIOR FLEXIBILITY**—To accommodate variations in car or truck spotting. Easy handling.

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TODAY there is a better type of loading arm for handling corrosive chemicals! Only BARCO can give you the combination of advantages that characterize the installation shown above. Here the loading arms (15 hermetic type assemblies) are required to handle 50% Sodium Hydroxide and 26% Oleum, Glacial Acetic Acid, Acetic Anhydride, Anhydrous Ammonia, 96% Sulphuric Acid, Nitric Acid, Mixed Acids, 78% Sulphuric, Nitro-Benzene, and Aniline.

The fact that Barco meets such requirements EASILY, EFFICIENTLY, and ECONOMICALLY is indication of the inherent superiority of Barco Flexible Ball Joints for chemical loading arm service. *Inquiries are invited; Ask for Catalog 215B.*

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The Only Truly Complete
Line of Flexible Ball, Swivel, Swing and Rotary Joints
In Canada: The Holden Co., Ltd., Montreal

Check 5293 opposite last page.

CURRENT LITERATURE

Plant Engineering and Maintenance

Pipe wrenches and hand tools are cataloged in a bulletin published by — The Ridge Tool Company.

Check 5294 opposite last page.

Woven-wire-screen and wire-cloth products, fabricated for grinding, sizing, scalping, dewatering or filtering applications, are specified in Bul 160—The Cleveland Wire Cloth & Mfg. Co.

Check 5295 opposite last page.

Pressure washer which utilizes cold steam to provide cleaning action is presented in four-page Hydro-Air Washer Bul—D & M Products, Inc.

Check 5296 opposite last page.

Flexible motor couplings are immediately available off-the-shelf for shafts to 2-½". Complete information on these is detailed in Folder 2875 — Link-Belt Company.

Check 5297 opposite last page.

Wire cloth, which is manufactured from any metal or alloy (including titanium) in nine basic weaves, is reviewed in Wire Cloth Cat—The Cambridge Wire Cloth Co.

Check 5298 opposite last page.

Coated-fabric work gloves are made in gauntlet, knit-wrist, band-top and safety cuff styles — all in jumbo sizes, with or without ventilated backs. Additional information on gloves is incorporated in Silvertex Gloves Bul — The Surety Rubber Company.

Check 5299 opposite last page.

Wire cloth is available from stock to 244" wide, in rolls or cut to size. It is explained in Cat 57—Multi-Metal Wire Cloth Co., Inc.

Check 5300 opposite last page.

Color-coding of pipe and duct systems is easily done with plastic tape. Use of tape can simplify tracing or servicing of fluid lines, electrical conduit, air ducts, and other in-plant systems. Tape, which is available in eight colors, is further described in Plastic Tape Bul—Minnesota Mining and Manufacturing Company.

Check 5301 opposite last page.

New Line of corrosion-resistant needle valves

MARSH *Needle Valves*

in 316 STAINLESS STEEL

Throttle flow and throttle corrosion with this new valve series that gives you the superlative construction of Marsh Needle Valves with the corrosion-resistance of 316 stainless steel.

Here is a valve that gives you precision throttling and tight closure on pressures from a few pounds to 6000 psi. Wide temperature range, too—from minus 100°F. to plus 500°F. —as a result of the Marsh "Marpak" packing system utilizing precision moulded Teflon.

New 316 stainless series (series 1936) is identified by blue handle. Sizes from ⅛" to 1"; globe, angle, and panel mounted patterns.

Marsh Needle Valves are also available in 416 stainless steel (identified by green handles) and in alloy steel (identified by yellow handles).

Ask for bulletin NV-3

MARSH INSTRUMENT COMPANY, Dept. Z, Skokie, Ill.
Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas

Check 5302 opposite last page.

Pneumatic tools for tube maintenance, including expanders, cleaners and cutters, are covered in Tube-maintenance Tools Bul—Airetool Manufacturing Company.

Check 5303 opposite last page.

Centrifugal compressors are explained in detail in 22-page Bul C-83—The Cooper-Bessemer Corporation.

Check 5304 opposite last page.

Graphic picture of operations is spotlighted in color with control board. Mounted unit is pictured in 24-page Booklet AA-40—Graphic Systems.

Check 5305 opposite last page.

Broken factory floors can be repaired quickly with concrete patch which can be walked-on and run-over immediately after application. It is covered in Instant-Use Brochure—Flexrock Company.

Check 5306 opposite last page.

Two-stage compressors of rotary type are equipped with overhead intercoolers to overcome space problems. Produced in 30 to 3300 cfm, range for pressures to 125 psig, they are presented in Bul C-5A — Fuller Company, Subsidiary of General American Transportation Corporation.

Check 5307 opposite last page.

Drives and couplings, which incorporate (instead of fluid) heat-treated steel shot, are available off-the-shelf in capacities of fractional to 1000 hp. They are reviewed in Flexidyne Tech Bul — Dodge Manufacturing Corporation.

Check 5308 opposite last page.

Magnetic starters in sizes 6, 7 and 8 are built with a plate in door to accommodate modifications. They are detailed in Bul 8536 — EC-&M Division, Square D Company.

Check 5309 opposite last page.

Force-feed lubricators are designed to deliver right amount of oil to bearings, cylinders and packing . . . starting, stopping, speeding-up and slowing-down in synchronization with machinery. They are reviewed in Lubricators Cat—Manzel, Unit of Houdaille Industries, Inc.

Check 5310 opposite last page.

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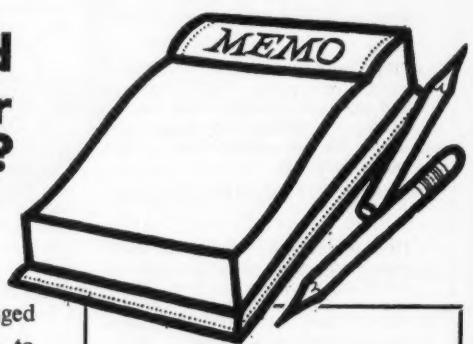

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DECOLORIZING, PURIFYING CORN SYRUP automatically

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VALLEZ ROTATING LEAF PRESSURE FILTER

These Vallez rotating leaf pressure filters were designed specifically for removing color and purifying corn syrup. The complete filter element is all stainless steel type 316 construction, with special nylon filter cloth. The filters can be completely controlled by automation.

Write for complete detailed information on this and other G-B process equipment.

See our catalog in Chemical Engineering Catalog.

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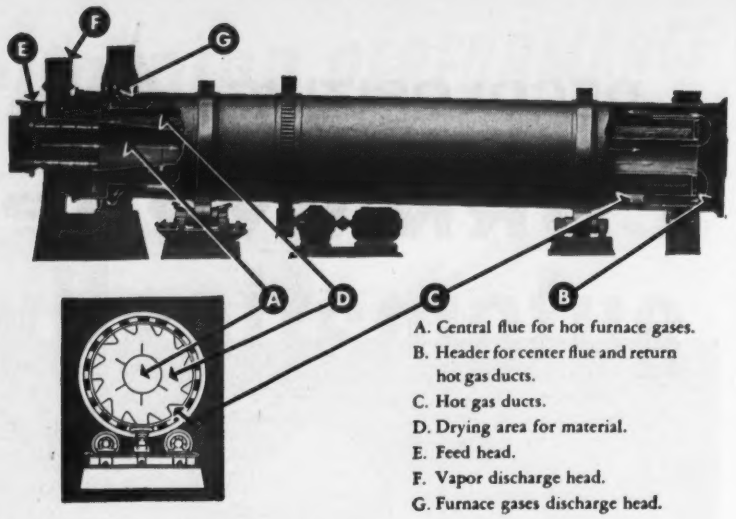
FILTERS • EVAPORATORS • PROCESS EQUIPMENT • CONTRACT MANUFACTURING including HEAVY CASTINGS

Check 5311 opposite last page.



A. Central flue for hot furnace gases.
B. Header for center flue and return hot gas ducts.
C. Hot gas ducts.
D. Drying area for material.
E. Feed head.
F. Vapor discharge head.
G. Furnace gases discharge head.

Ruggles-Coles INDIRECT-FIRED DRYERS and HEATERS

- Dry without contamination from combustion gases, regardless of fuel.
- Minimize auxiliary dust collection when handling fine precipitates and filter cake.
- Heat pulverized materials for process work.
- Collect vapors at high concentration.
- Available fabricated with heat and corrosion-resistant metals.

104" diameter by 65' long Ruggles-Coles Indirect Dryer removing moisture from washed and filtered Kaolin clay at Gardner, Ga., plant of Mineral and Chemical America, Edgar Division.

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Check 5312 opposite last page.

Corrosion Control

Accurate metering of corrosive, toxic or hazardous liquids is topic of discussion of Bul 1157-3 — Milton Roy Company.

Check 5313 opposite last page.

Corrosive or volatile fluids can be handled smoothly by ductile-iron pipe fittings which have high-yield strength of 45,000 psi. More information is included in Ductile-iron Pipe Fittings Bul — The Kuhns Brothers Co.

Check 5314 opposite last page.

Throttlable plastic gate valves are available in polypropylene, Penton and PVC. Rated for 150 psi and vacuum service, valves are made in ½ to 2" sizes with socket-weld flanged or screwed ends. They are discussed in Bul 42A — Vanton Pump & Equipment Corp., Division of Cooper Alloy Corp.

Check 5315 opposite last page.

Corrosive or explosive fumes, extreme heat or high humidity can be moved with belt-driven axial fans. Line features 10- and 12-gage drums and is available in sizes to 60". Additional specifications are contained in Bul 620-CP — Propellair, Division of Robbins & Myers, Inc.

Check 5316 opposite last page.

Plug gate valves for corrosive service incorporate Teflon O-rings and seats and stainless-steel bodies. They are covered in Plug Gate Valve 66 Bul—Alloy Steel Products Company.

Check 5317 opposite last page.

High-temperature valve-stem packings incorporate corrosion-resistant inhibitor. Packings are available in grades for service of 600°F, 900°F and over-900°F applications. They are reviewed in High-temp Valve Packing Bul—Packing Division, Raybestos-Manhattan, Inc.

Check 5318 opposite last page.

Shaft seals for corrosive service are designed so that all parts normally contacting fluid are made of Teflon. Complete line (⅝ to 3") is topic of Bul S-233 — Crane Packing Company.

Check 5319 opposite last page.

Anti-corrosive wire cloth, including space, mesh, bolting, filter, backing, strainers, sieves, and fabricated-parts types are considered in Wire Cloth Bul—Newark Wire Cloth Company.

Check 5320 opposite last page.

Fluids handling (992) and its various facets—including glassed-steel storage (975); tantalum, titanium and zirconium for process equipment (978); heat exchangers and condensers from standardized components (949); evaporating "problem" products (991); glassed-steel reactors (988); and glassed-steel pipe which can be field-cut (989)—are covered in Buls 992, 975, 978, 949, 991, 988 and 989—Pfaudler Division, Pfaudler Permutit Inc.

Check 5321 opposite last page.

Metering pump for sulfuric acid and other strong oxidizing agents forces liquid through Hypalon tube by wave-like action of steel fingers which never contact metal. Unit is expanded upon in Metering Pump T6SH Bul — Sigmamotor Inc.

Check 5322 opposite last page.

Corrosion-resistant floor surfacing for concrete construction can be applied by hand troweling, or by spray equipment available from manufacturer. It is specified in Penntrowel Bul—Corrosion Engineering Products Dept. 358, Pennsalt Chemicals Corporation.

Check 5323 opposite last page.

Sealless plastic pumps, are available in capacities to 40 gpm, discharge pressures to 40 psi, for temperatures of −60 to +350°F. Line is delineated in Booklet 10A — Vanton Pump & Equipment Corp., Division of Cooper Alloy Corp.

Check 5324 opposite last page.

Corrosion-resistant fittings, including long-tangent elbow which has consistent strength and effective corrosion resistance all along the line, are tabulated in Speedline Fittings Cat — Horace T. Potts Company.

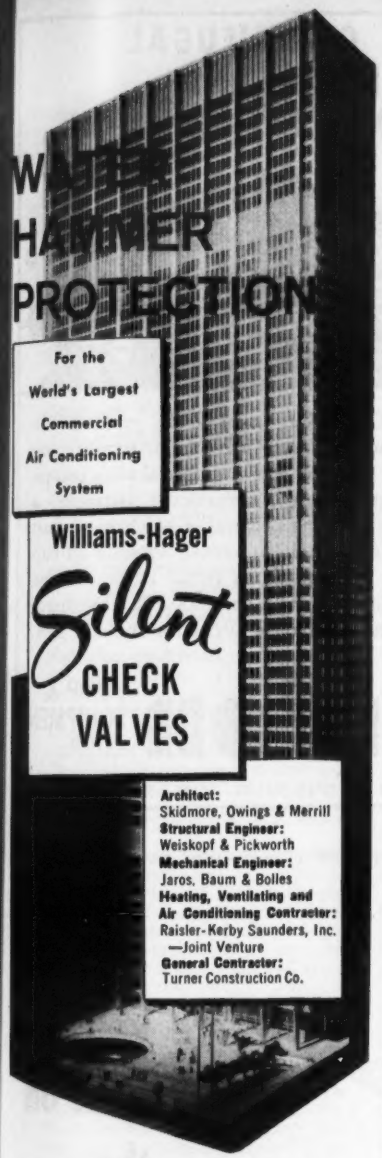
Check 5325 opposite last page.

Teflon shaft packings are available in two styles: one compounded of approximately 94% shredded Teflon and graphite friction reducer, molded into packing rings; second, same except mica is used as friction reducer. Packings are topic of Bul CP 552 — Chemical & Power Products, Inc.

Check 5326 opposite last page.

Teflon-lined pipe is resistant to any chemical material (except high-temperature fluorine and molten alkali metals) to 500°F. Design Incorporates integral gasket formed from liner over full face of flange. Pipe is further considered in Teflon-lined Pipe Bul—Resistoflex Corporation.

Check 5327 opposite last page.



In the CHASE MANHATTAN BANK building in New York, a magnificent new 60-story structure, *Silent Check Valves* reliably protect pumps and the piping system against surge pressures and resulting water hammer.

Write for Bulletins: No. 659 on Pressure Loss Tests . . . No. 654 on Valves . . . No. 851 on Cause, Effect and Control of Water Hammer.

THE WILLIAMS GAUGE CO., INC.

146 Stanwix Street, 2 Gateway Center
Pittsburgh 22, Pa.

Our 74th Year • 1886-1960

Check 5328 opposite last page.

CURRENT LITERATURE

Fighting corrosion with protective coatings is subject of manual incorporating information on surface-preparation simplification, what top coating to use for over 100 corrosive conditions, how many coats, how to maintain coatings in good condition, and common spraying troubles and how to remedy them. Tygon Painting Manual —Plastics and Synthetics Division, U.S. Stoneware.

Check 5329 opposite last page.

Corrosion-resistant valves of various types — including large flanged-end bolted-cap swing-check; bolted flanged bonnet, flangedend OS&Y "Y"; and 150-psi OS&Y gate types — are reviewed in Corrosion-resistant Valves Cat — The Wm. Powell Company.

Check 5330 opposite last page.

Tube and pipe, which are fabricated of centrifugally cast, thermoset, epoxy resin-reinforced material, are specified in Fibercast Tube & Pipe Bul—Fibercast Company, Division of Youngstown Sheet and Tube Company.

Check 5331 opposite last page.

Relief valves for corrosive service utilize design in which topworks are completely isolated from process stream by Teflon diaphragms. Available in sizes from ¼" for pressures to 1500 psi, valves are explained in Bul 357-2—Milton Roy Co.

Check 5332 opposite last page.

Packless plug valves are available in corrosion-resistant aluminum, stainless steel, lined cast iron, etc., in sizes of ⅜ to 10". Complete line is reviewed in Plug Valves Cat — Dia-Plug, Division of Cryogenics Corporation.

Check 5333 opposite last page.

Material Handling

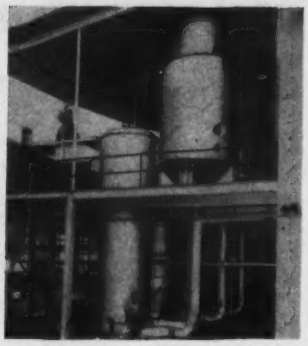
Fork-lift trucks, are gas-operated and electric-driven. They are available in capacities of 3000 to 10,000 lb (cushion tires) and 3000 to 8000 lb (pneumatic tires). Both types are covered in Gas-operated Lift Trucks Bul — Automatic Transportation Company, Division of The Yale & Towne Manufacturing Company.

Check 5334 opposite last page.

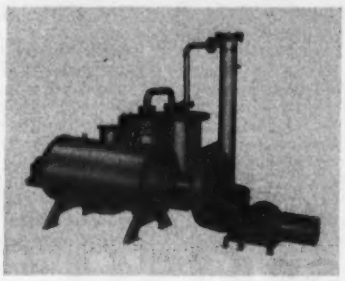
Truck dumpers are made in sizes to 70′ in scale or non-scale types. They are detailed in Truck Dumpers Bul — Screw Conveyor Corporation.

Check 5335 opposite last page.

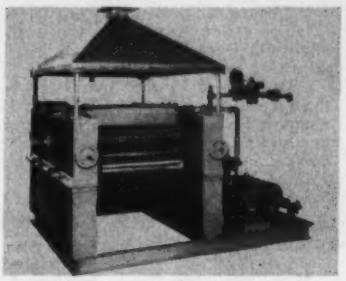
G-B HEAT TRANSFER EQUIPMENT



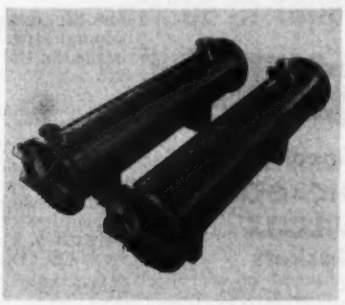
▲ EVAPORATOR — All stainless steel quadruple effect.



▲ VACUUM ROTARY DRYER — Designed for efficient removal of moisture at low temperatures.



▲ DRUM DRYERS—Available with a variety of feed arrangements.



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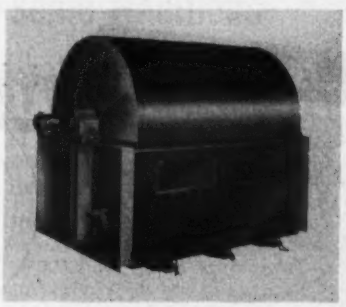

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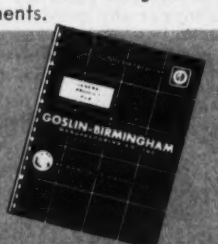

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Check 5336 opposite last page.

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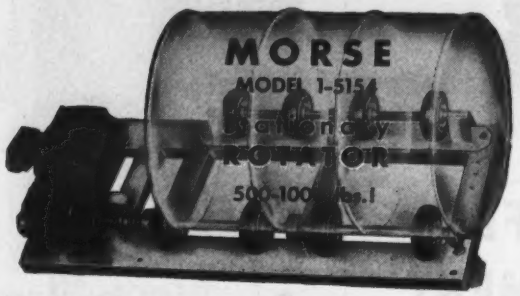

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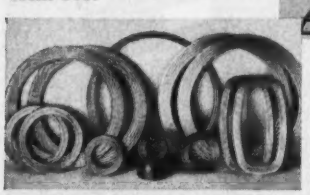

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Check 5338 opposite last page.

CURRENT LITERATURE

Tractor-shovels come in 20 models and eight capacity ranges—to 12-,000-lb operating capacity. They are subject of the booklet, "Industrial Materials Handling the 'Payloader Way'"—The Frank G. Hough Co., Subsidiary of International Harvester Company.

Check 5339 opposite last page.

Bulk feeders combine vibrating screw rotation with vibrating hopper, trough and tube. They are offered in three styles — standard volumetric, feeder-conveyor volumetric or gravimetric. Feeders are topic of Bulk Feeders Cat — Vibra-Screw Feeders, Inc.

Check 5340 opposite last page.

Bulk shipment of polyethylene and polystyrene, by means of special railroad car providing sanitation and protection for materials requiring careful handling, is being utilized by eight major chemical companies. Full story is contained in Dry-Flo Car Bul — Airslide and Dry-Flo Car Division, General American Transportation Corporation.

Check 5341 opposite last page.

Automatic net-weighing machines are tabulated in Buls 3311, 3318 and 3363—The Exact Weight Scale Co.

Check 5342 opposite last page.

Fork-lift trucks, each of which incorporates two driving wheels, are detailed in Bul KHL—Lift Trucks, Inc.

Check 5343 opposite last page.

Gas transports each consists of normalized-seamless-steel pressure vessels, grouped and mounted on trailer chassis with either single or tandem axle. Complete details are included in Cat 58 — Harrisburg Steel Co., Div. of Harsco Corp.

Check 5344 opposite last page.

Scales and weighing equipment for various applications are considered in Condensed Cat 2001—Toledo Scale, Division of Toledo Scale Corporation.

Check 5345 opposite last page.

Vibratory feeders have totally enclosed drive elements as standard construction. AC-operated electro-permanent-magnetic-drive units are subject of Vibratory Feeders Bul — Eriez Manufacturing Company.

Check 5346 opposite last page.

Private haulers equipped with special trucks can provide a waste-disposal service based on placement of large storage containers at convenient locations in plant. Containers are emptied by trucks on schedule or on a call-in basis, for monthly fee. Truck units are described in Dumpmaster Bul—Dempster Brothers Inc.

Check 5347 opposite last page.

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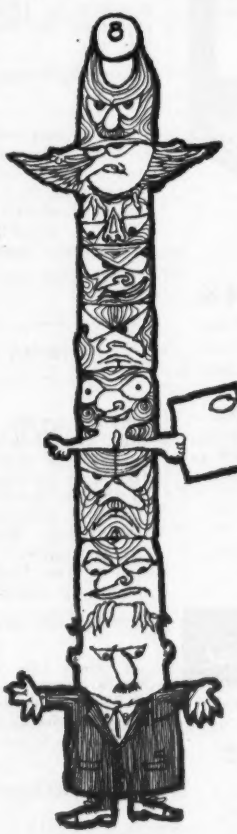

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Semi-bulk handling of difficult materials is possible with bin which can be tumbled, vibrated and aerated. Unit is subject of Invert-A-Bin Bul—The Powell Pressed Steel Company.

Check 5349 opposite last page.

Process Instrumentation

High-pressure gages of all types are listed in catalog published by Strahman Valves, Inc.

Check 5350 opposite last page.

Two metering pumps — one capable of 812 gph at 10,000 psi, and second with capacity of 13.1 gph at 1000 psi — are described in Metering Pumps 200 and 100 Buls — Pump Division, American Meter Company, Incorporated.

Check 5351 opposite last page.

Signaling controllers are available as potentiometer or bridge-type units. They automatically, continuously provide two-position control of any process through use of any DC signaling transducer. Specifications are tabulated in Cat 51-5 — Thermo Electric Co., Inc.

Check 5352 opposite last page.

Servo-operated recorders of pneumatic (98286) and electronic (98335) types, each have threshold sensitivity of 0.1% to input signal and have three-months ink supply mounted on pen. They are covered in Buls 98286 and 98335—Taylor Instrument Companies.

Check 5353 opposite last page.

Heated gages and valves are built to meet special conditions present when working with liquids which must be kept at higher-than-ambient temperatures. Complete details are tabulated in Heated Gage Cat — Jerguson Gage & Valve

Check 5354 opposite last page.

Pressure transmitter mounts right on process pipe or tank. Flush-diaphragm unit is delineated in Buls A-713 and A-718—Swartwout Division, Crane Co.

Check 5355 opposite last page.

Liquid-level control — which incorporates sleeve, raised and lowered within non-magnetic tube, to attract or release an Alnico magnet attached to mercury switch — is topic of Liquid-level Controls Cat—Magnetrol, Inc.

Check 5356 opposite last page.

Valves, for automatic control of pressure, temperature, fluid level and flow are available for steam, gas, air, water and chemical services. They are expanded upon in Control Valves Cat—Klipfel Valves Incorporated, Division of The Hamilton-Thomas Corporation.

Check 5357 opposite last page.

Control valves are reviewed in Bul CV53—Kieley & Mueller, Incorporated.

Check 5358 opposite last page.

Processing Equipment

Processing-equipment line—including mixers of various types, blenders, ball and pebble mills, extrusion and agglomeration equipment, vibrating screens, industrial fans and duct boosters, jar mills, and laboratory equipment—is covered in eight-page Bul 300—International Process Equipment Company, Division of The Patterson Foundry & Machine Co.

Check 5359 opposite last page.

Portable mixers, each consist of two rotating impellers and two stationary stators enclosed in cylindrical housing. They are delineated in Shear-Flow Mixers Bul — Gabb Special Products Inc.

Check 5360 opposite last page.

Ion-exchange regeneration system, whereby downward flow produces barrier to keep bed from being expanded by upward flow of regenerant, is topic of Counterflow System Bul — Illinois Water Treatment Co.

Check 5361 opposite last page.

Glass-bag filters for fighting air pollution and hot dust incorporate either of two cleaning devices—mechanism for dust removal by sonics of swaying-action arrangement. Details are included in Glass-bag Filters Bul—Dracco Division, Fuller Company, Subsidiary of General American Transportation Corporation.

Check 5362 opposite last page.

Waste-handling equipment is considered in a bulletin available from Yeomans.

Check 5363 opposite last page.

Packed-tower support plates and distributors are illustrated and described in Engineering Manual TA-40 — Process Equipment Division, U.S. Stoneware.

Check 5364 opposite last page.

Pressure-leaf filters' design includes inlet baffling to distribute cake evenly over all leaves and cake-thickness detector. They have four sluicing options and are treated in Cat EF/2a — Enzinger Company, The Duriron Division, Inc.

Check 5365 opposite last page.

Batch mixers, in capacities of 5 qt to 160 cu ft, are available in hand- and motor-driven models. Further details are contained in Bul X-19R —Industrial Division, Daffin Manufacturing Company.

Check 5366 opposite last page.

NEW MIXER

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You won't have to lubricate it for five years.

You can't overload the gear drive.

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Check 5367 opposite last page.

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1900's

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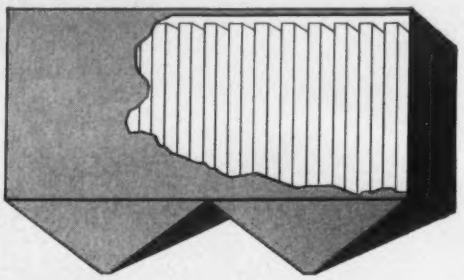

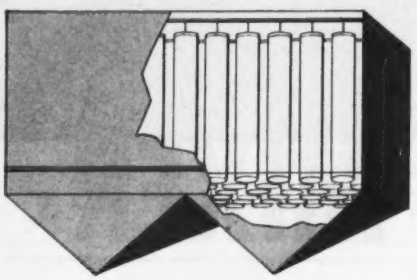

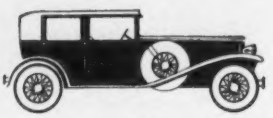

1930's

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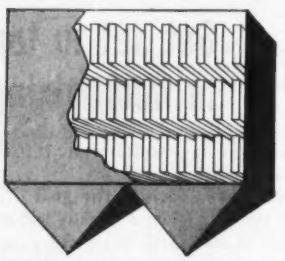

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Check 5368 opposite last page.

CURRENT LITERATURE

Packaged processing system, including machinery for crushing, mixing, grinding and sifting—in addition to series of four negative-pressure pneumatic-conveying systems—is subject of Bul F-19—Sprout-Waldron.

Check 5369 opposite last page.

Dust collectors which incorporate continuous cleaning action are specified in 36-page Cat 104 — The W. W. Sly Manufacturing Co.

Check 5370 opposite last page.

Pulverization by collision of particles in high-velocity jet streams of air, steam or gas, is subject of Pulverizers Bul — Majac, Inc.

Check 5371 opposite last page.

Centrifuge line has models to handle slow-draining crystals and amorphous solids, friable crystals and free-draining crystals. Various models are delineated in Centrifuges Bul — The Sharples Corp.

Check 5372 opposite last page.

Liquid-gas separation can be effectively accomplished through use of units which are available in capacities of 7000 scfm at pressures to 200 psig. Line is tabulated in Bul 109—Selas Corporation of America.

Check 5373 opposite last page.

Plate magnets have design incorporating all-welded-steel and stainless-steel construction. They may be installed in chutes, spouts, ducts, feed tables and housings. Line is specified in Plate Magnets 17 Data — Eriez Mfg. Co.

Check 5374 opposite last page.

Dispersion-mill design permits micrometer adjustments to be made on stationary stone to 0.0001". Head of mill opens on hinges to give quick access for cleaning. Other features of line are outlined in Hy-R-Speed Mill Bul—The J. H. Day Co., Division of The Cleveland Automatic Machine Co.

Check 5375 opposite last page.

Micronizers grind and classify in one operation in single chamber to provide fines in range of ½ to 44 microns. Units are specified in Micronizing Bul — Sturtevant Mill Co.

Check 5376 opposite last page.

Screeners and coolers lines are both completely enclosed and dust tight and incorporate horizontal gyratory rotation action. They are considered in Screeners and Coolers Buls—Orville Simpson Co.

Check 5377 opposite last page.

Jet-Venturi fume scrubbers can be used to clean and purify gases without fan or blower, or to recover solids. Fume Scrubbers Cat —Croll-Reynolds Co., Inc.

Check 5378 opposite last page.

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2 ways Gates high capacity V-Belt Drives contribute to industry profits

ON IN-PLANT EQUIPMENT, Gates Super HC V-Belt Drives lower maintenance costs—as on this pump at Scott Paper Company's Detroit plant. The pump was formerly driven by a special belt, but 6 of these belts failed in about 3 months. In comparison, a Super HC Drive has been operating for the past year with NO down time and NO replacement cost.

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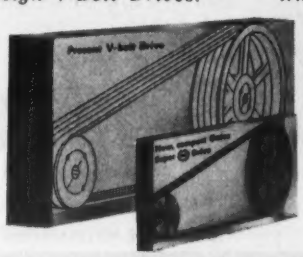

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Piping Natural Gas	Piping Demineralized H_2O	Chicken Feed Troughs
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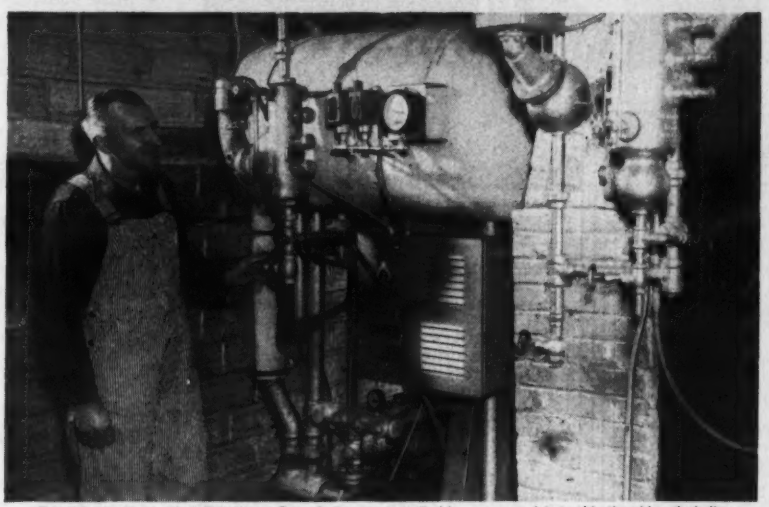

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The Kerr Conserving Company of Portland, Oregon, makes berry juice concentrates used extensively by manufacturers of flavors and extracts, fruit syrups, beverages, etc.

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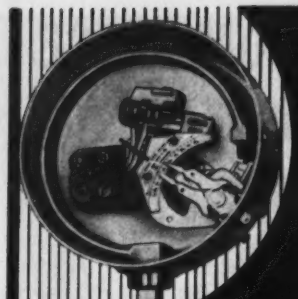

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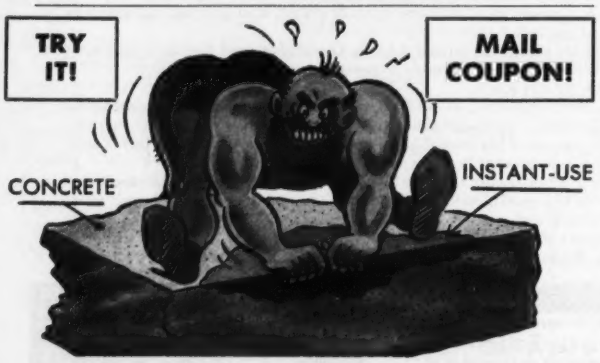

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that's interesting

Meat flavors isolated

Minute amounts of flavor-producing compounds have been extracted from beef and pork by U.S. Department of Agriculture scientists who hope to find a means for flavoring algae or other food concentrates being developed for space travel.

Flavor precursors are primarily low-molecular-weight polypeptides, carbohydrates and amino acids. It is believed that flavors are produced by interaction of these compounds.

Portable water softener 500 times more efficient

Water softening unit, measuring 12 x 12 x 20", is rated 500 times more efficient than comparable electrical devices by its inventor, Dr. Joseph A. Schufle, chemistry professor at New Mexico Institute of Mining & Technology.

It removes salts and other impurities from hard water at rate of 2 gal/hr on 10 w of electricity. An electric still with equivalent capacity would require 5000 w.

It imparts an electric impulse to water which forces ions — electrically charged particles of impurities — into a porous membrane. From there the ions are discharged in a small waste stream.

In Socorro, N. M., where the impurity rate had been 155 parts per million, unit produced water of distilled quality — containing no more of 5 parts of impurities per million parts water.

Nylon gas lines next?

Major automobile manufacturers reportedly are evaluating Nylon 6 tubing as gas lines for tomorrow's automobiles, but Spencer Chemical Company is already using the lines on its fleet automobiles.

Spencer uses ¼" tubing with 1/32" wall thickness, and says they are easy to install, eliminate need for flexible connections, can be used with standard fittings, and hold up well.

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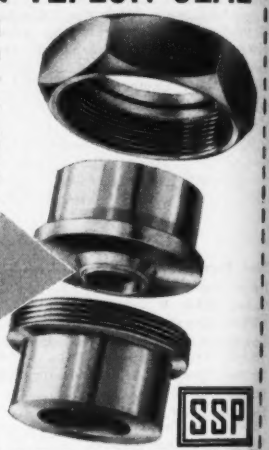

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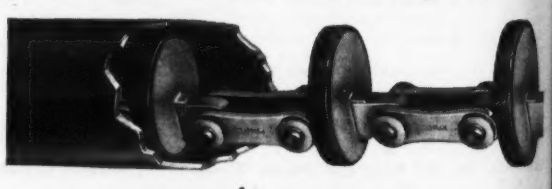

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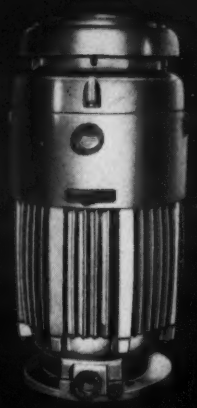

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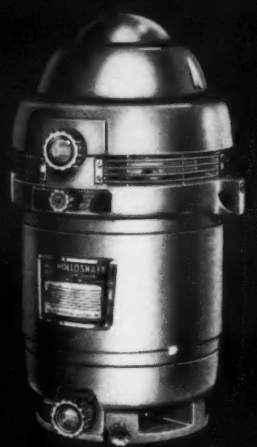

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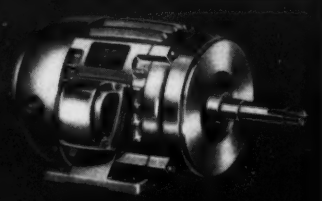

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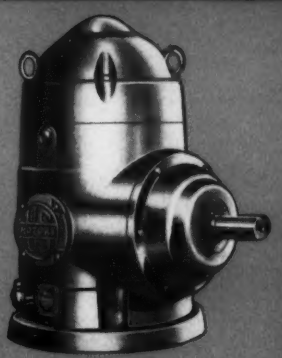

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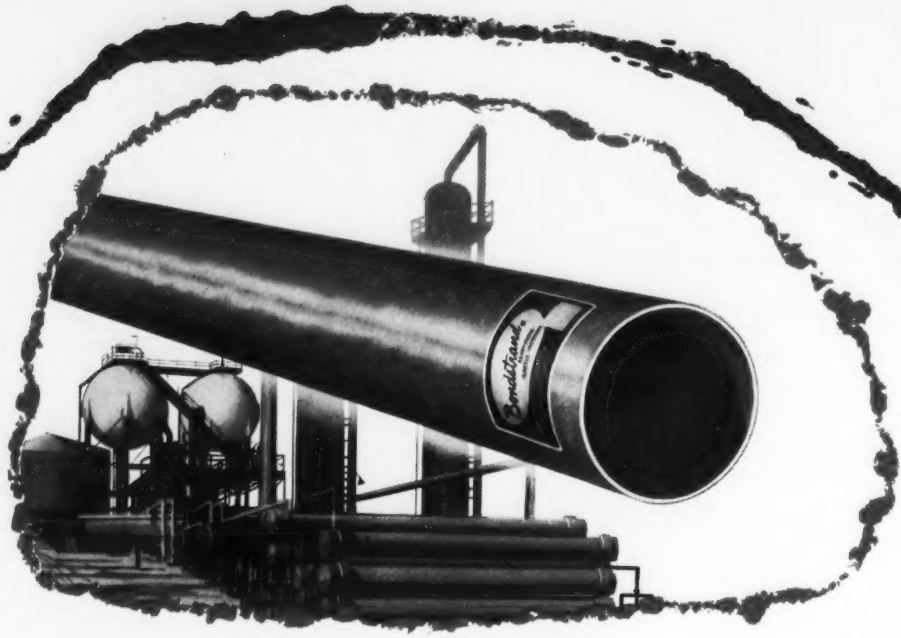

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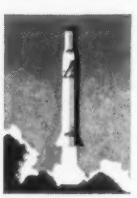

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